OCTOBER 1, 1947

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AUTOMOTIVE INDUSTRIES

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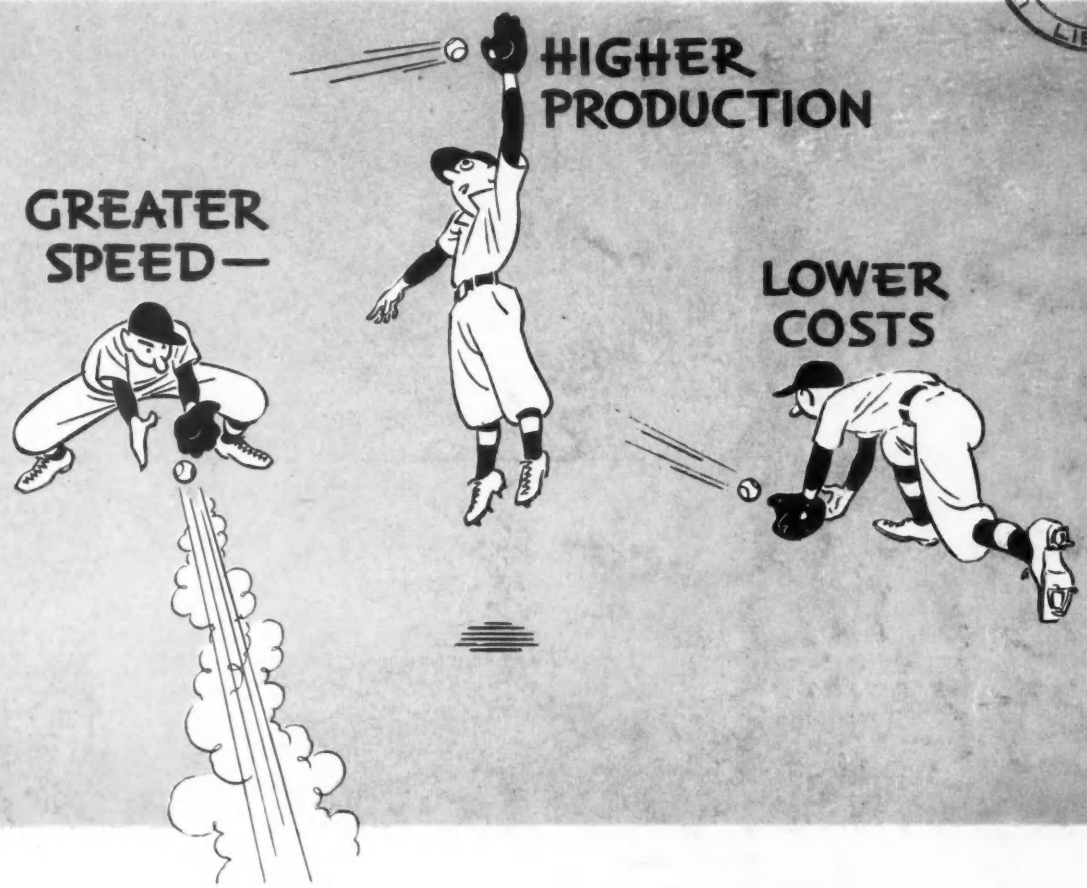

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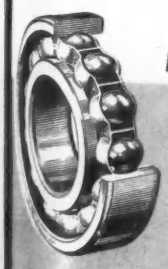

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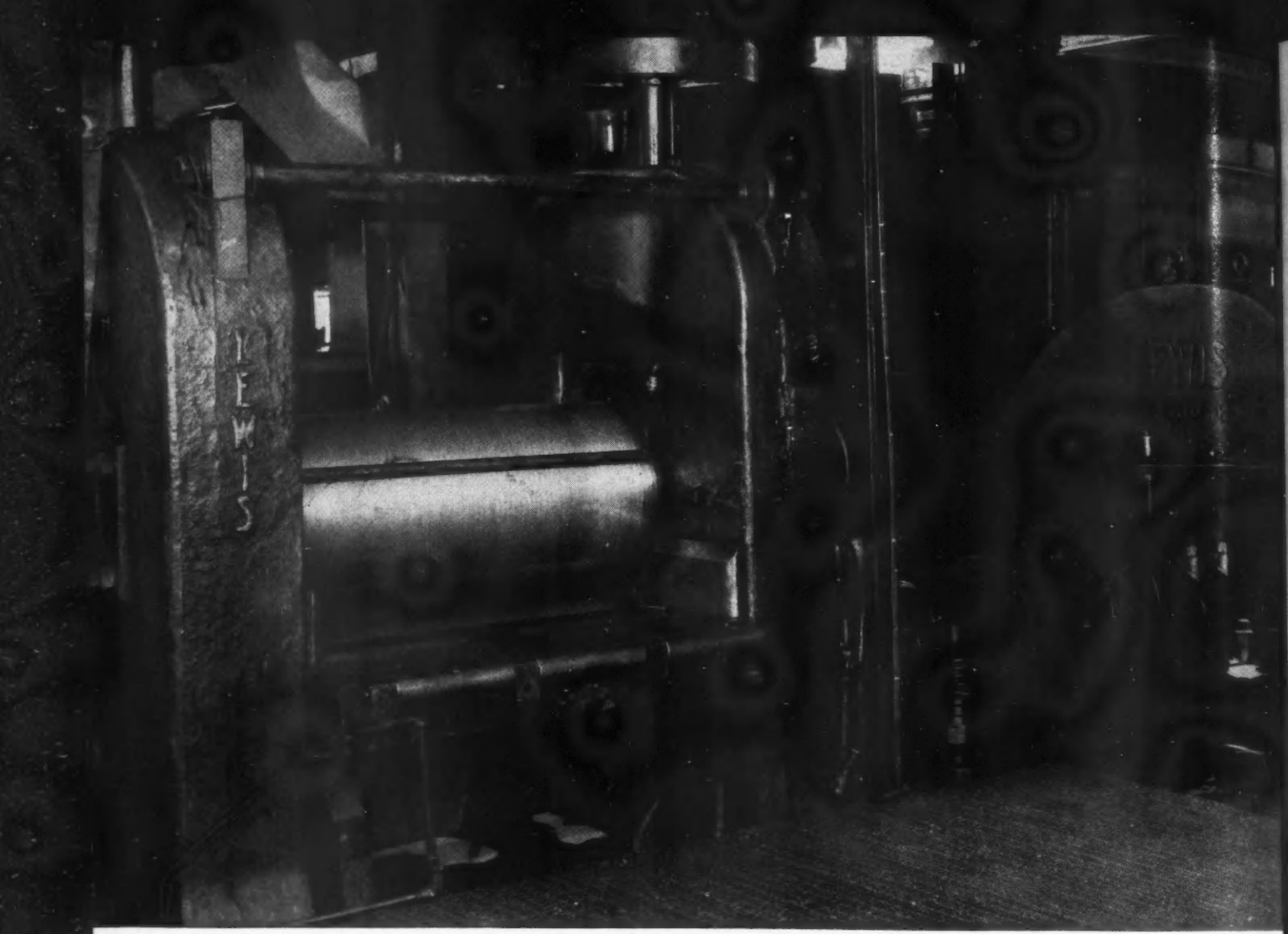

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AUTOMOTIVE INDUSTRIES

Published Semi-Monthly October 1, 1947 Vol. 97, No. 7

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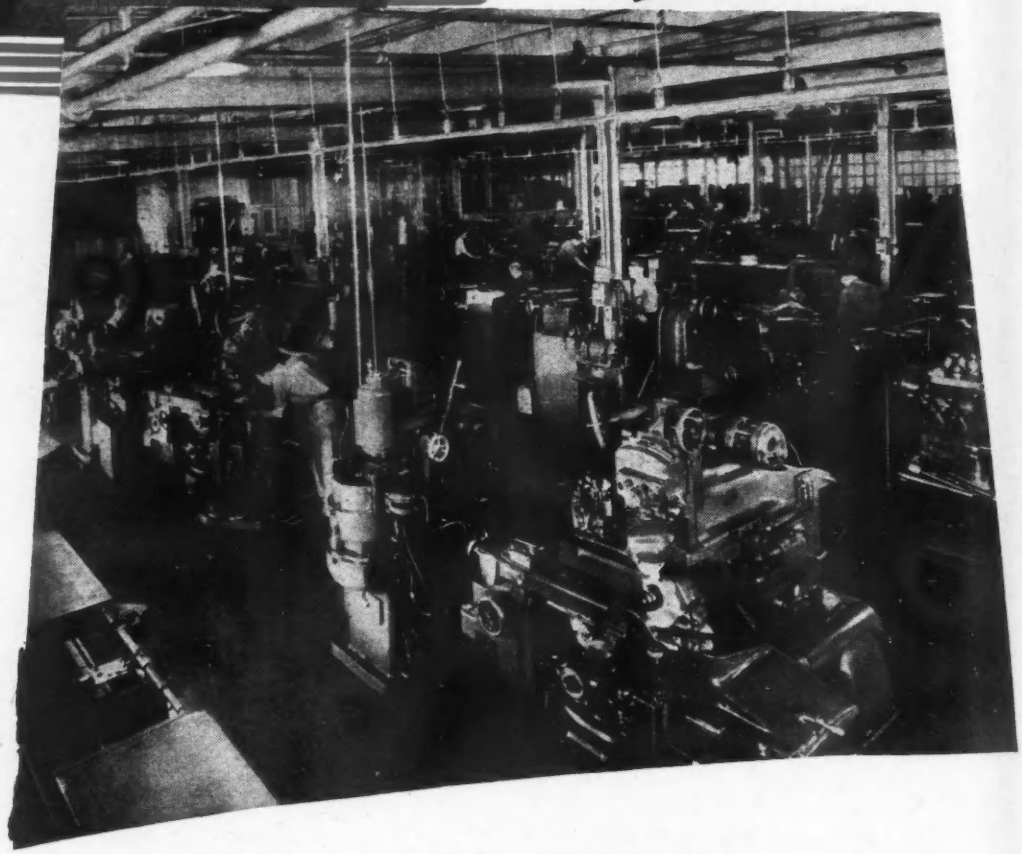
YESTERDAY...

TODAY



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AUTOMOTIVE INDUSTRIES

Published on the first and 15th of the month

October 1, 1947
Volume 97, No. 7

Some High Spots of this Issue

A Radically Different Method of Building Motor Coaches

First motor vehicle application of the master tooling-dock system for constructing assembly fixtures is found in Consolidated Vultee's method of building motor coaches at its Nashville plant. The major operations in this high-production method are described and illustrated in an article prepared by Leland A. Bryant, designer of the master tooling dock, which begins on page 24.

Automatic Transfer Machines

Transfer line technique at Buick now includes four independent Foote-Burt machines for automatic drilling, reaming, boring and tapping operations on cylinder heads. Also described in this article is the new transfer machine line at Borg-Warner's Detroit Gear Division plant for volume production of transmission cases. Pages 30-34.

Italian Automobile Styling

Latest Italian custom styling in convertibles and coupes is illustrated in a series of photos on pages 36 and 37.

British Gasoline Injection Engine for Trucks

An engine manufacturer in Great Britain obtained large gains in the performance of his standard six-cylinder Diesel model by converting it to gasoline operation with spark ignition. The cylinder head, pistons and fuel injection equipment were changed, and a 12-volt ignition system was added. Otherwise, the gasoline version was similar to the original Diesel model. Complete details of the new engine are given on pages 38, 39 and 40.

Pontiac's Expanded Facilities

Improvements at the Pontiac plant include a full automatic chromium plating plant, new and enlarged cupolas in the foundry and a new parts warehouse, all of which are described by Joseph Geschelin in an article beginning on page 42.

22 New Production Equipment and New Product Items And Other High Spots Such As:

Complete list of current passenger-car prices and weights; statistical quality control at the Timken-Detroit Axle Co.; sectional views of the International Harvester Co.'s Western model truck engine; details of the French national racing car; description of Federal-Mogul Corp.'s strip-mill process for manufacturing the H-24 metal-powder bearing; and an announcement of Fuller's new auxiliary transmissions.

Comprehensive Interpretation of News of the Industries, Page 17

For Complete Table of Contents, See Page 3

AUTOMOTIVE INDUSTRIES

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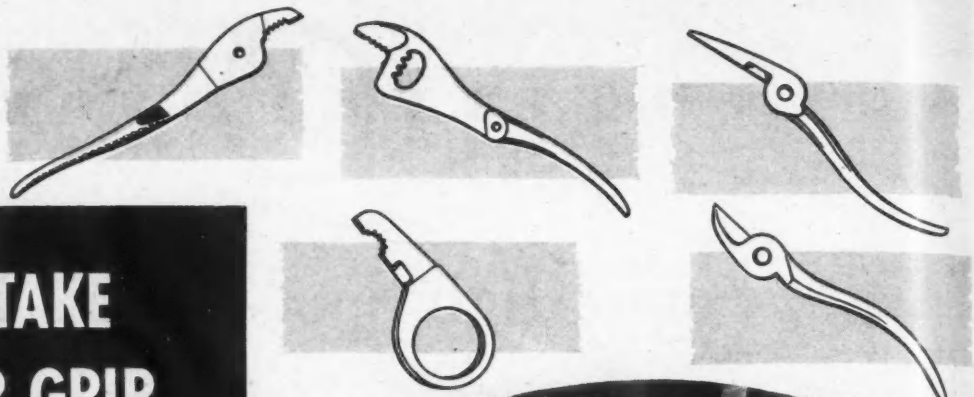
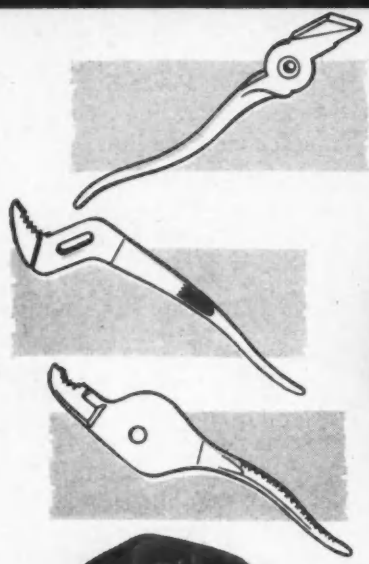
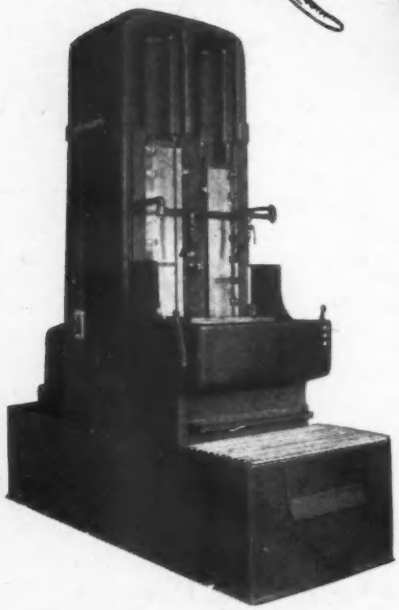


PLIERS TAKE A FIRMER GRIP AT A LOWER COST

Close-up of tooling on CINCINNATI No 5-54 Duplex Vertical Hydro-Broach. Five parts are displayed on the table. Inside of the jaw and slip-joint surface are broached at the rate of 208 completed parts per hour, or a total of 416 operations per hour





CINCINNATI No. 10-54 Duplex Vertical Hydro-Broach. Complete specifications on the 3-, 5-, and 10-ton sizes may be obtained by writing for catalog M-1387-1.

Pliers must grip firmly in the hands of the skilled mechanic, home workshop enthusiast, or housewife, and because so many people use them, they must be priced within reach of the bargain hunter Only a quality product with machined surfaces meets all these requirements, and only through broaching can the surfaces be machined at a minimum cost. ¶ That's where CINCINNATI Hydro-Broach Machines and Application Engineers fit into the picture. An example of their work is illustrated above . . . a CINCINNATI No. 5-54 Duplex Vertical, tooled up to broach the inside of jaws and slip-joint surfaces on a family of five pliers. The parts progress from the left- to the right-hand fixture. With automatic clamping and unclamping to aid the operator, he easily produces 208 parts per hour, completely broached through both operations. ¶ Many types of pliers and wire cutters, a few of which are illustrated here, are today being broached to high standards of accuracy and finish, and at extremely low unit cost, on CINCINNATI Hydro-Broach Machines. Take a tip from the plier manufacturers, and reduce your costs with the aid of CINCINNATI broaching equipment and engineering. Ask for a field engineer to analyze your machining operations.

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Vol. 97, No. 7

NEWS of the AUTOMOTIVE INDUSTRIES

October 1, 1947

K-F Adds Custom Model To Current Kaiser Line

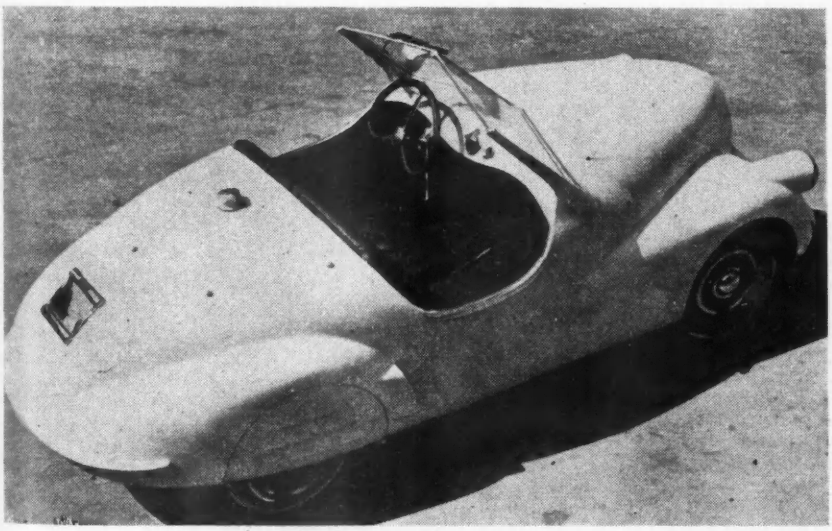
Kaiser-Frazer has announced the addition of another model to its line, the Kaiser Custom. The car will have the same engineering features as the current Kaiser, but will have de luxe treatment of appointments. The features are pull-down center arm rests front and rear, new instrument panel, and new color combinations. In price, it will fall between the present Frazer and the Frazer Manhattan. The company is also understood to have plans for a three passenger coupe and a new convertible, but the announcement time for these new models is still indefinite.

Close Hudson for New Car Changeover

First postwar model changeover shutdown by any manufacturer since the end of the war is now under way at Hudson Motor Car Co. Assembly lines stopped running Sept. 19, and are expected to remain stopped for several weeks. A. E. Barit, Hudson president, said that production of the new car, which he described as entirely different from any car ever produced, is under way so far as component units are concerned. From the limited description he gave the press, it is apparent that the new Hudson represents a radical departure from previous designs. Mr. Barit said the car has a lower center of gravity than any other American car, is only 5 ft high, and is entered by stepping down into it rather than up onto it. He said that the rear seat is completely ahead of the rear wheel and is 63 in. wide. The new Hudson has a completely new six-cyl engine with more horsepower than any other six on the market. The super eight engine also has been improved. It also has been confirmed, unofficially, that the car has some form of unit construction along the lines currently used in a Nash 600. It is said to have box frame units, although details are not clear. However, Mr. Barit pointed out that to produce the new car many of the assembly line techniques commonly used are being scrapped and an entirely new manufacturing approach developed. The car is said to comprise the coming trend toward wider bodies, with much greater visibility and window area with windshield curved in both horizontal and vertical plane. Current thinking in Detroit is that the car will be announced to the public either very late in November or early in December. Mr. Barit added that it was costing Hudson $16 million to bring the new car into production and added that factory and facility rearrangements required to produce the car are the most extensive ever taken in Hudson's 38-year history.

1948 Ford Truck Line Will Have New Engines

The new line of Ford trucks, scheduled for appearance very late this year or early in 1948, will carry the new line of Ford engines currently under development. A report that the truck line would have a separate line of engines different from those used in passenger cars has been refuted by a company spokesman. He pointed out that because of manufacturing economies the engine would have to be basically the same as those used in passenger cars with perhaps minor modifications.



Economical Midget

Measuring a scant eight ft in length and three ft in width, this midget car, the Volpe (Fox) manufactured by the Lombard Air Navigation Co., Milan, Italy, is reported to give 78 mpg. The Fox features an engine which is located in the rear. Acme photo.

Short Sheet Steel Delivery To Cut November Car Output

Although operations at the plants of the Carnegie-Illinois Steel Corp. are back to normal after being closed by a wildcat strike, current steel deliveries in Detroit are so tight that many automobile companies see little chance for uninterrupted production through all of November. Production during the first three weeks of September was exceptionally high going well over the 100,000 mark the second and third weeks. This apparently was at the expense of steel inventories, and there is little optimism about holding that rate. The best available estimate now of the 1947 production stands somewhere between 4.5 and 4.7 million vehicles. Observers are pointing out that this rate of production actually is above average for pre-war years, but looks bad, principally because of the great unfilled demand for automobiles and

Engineering Library

1948 Packard Eight and Station Sedan

Included among Packard's recently announced 1948 line was the Touring Sedan Eight (top) which has a straight eight engine developing 130-hp. On a 120-in wheelbase, the Eight is available in five body types, one of which, the Station Sedan (bottom), features an all-steel body and top.

the potential capacity of the industry to produce 20 to 30 per cent more, if there were no production obstacles.

Cobb Breaks Speed Record

Hurtling across the Bonneville Salt Flats, Utah, at average speeds of 394.196 mph for the measured mile and 393.825 mph for the kilometer, John Cobb recently set new world land speed records with his 24-cyl racer. Mr. Cobb's speed was about 403 mph for the measured mile and 399.808 mph for the kilometer on the northbound run over the course, and 385.645 mph for the mile and 388.019 mph for the kilometer on the southbound run.

Ford to Produce 1948 Parts At Leased Detroit Arsenal

In order to provide space necessary for decentralizing several machining and stamping operations on parts and assemblies for 1948 cars and trucks, Ford Motor Co. has leased the government arsenal in Detroit. The company will also house its parts and accessory section in the new plant. The arsenal was operated by Hudson Motor Car Co. from 1941 until 1944 when it was turned over to Westinghouse Electric Manufacturing Co., which continued operations until the government took over in February, 1946. There are 15 buildings on the 42 acre site, and the unit contains more than one million sq ft of floor space. Manufacturing operations will be entirely separated from other Ford units, and the operation will have its own plant manager, production engineering section and producing organization. Before Ford can install the 1000 machines required for operations, approximately $91 million worth of government equipment stored in the building will have to be moved. It is estimated that the surplus equipment represents 2400 freight car loads. D. S. Harder, Ford vice-president and director of manufacturing, stated he hoped the plant would be in full operation by early next year.

Toulmin Resigns from Tucker

In a controversy over expenditure of company funds, H. A. Toulmin, Jr., has resigned as chairman of the board of Tucker Corp. Mr. Toulmin is president of the Hydraulic Press Manufacturing Co., and in addition to many other business interests, is a well known patent attorney.

Plans Still Indefinite For '48 Automobile Show

Chances for an automobile show this year have gone glimmering, and there are no definite plans for a show next year. The AMA reveals that no positive action has been taken either to hold or not to hold a show next year. It normally requires about eight to nine months preparation to stage the national show, so that it would be necessary to start within the next two or three months in order to line up facilities and make other preparations for an exhibition in the fall of 1948. Manufacturers thus far have not broached the question, and it is felt that with the current shortage of materials, and the unprecedented demand for automobiles, there is little stimulation for an automobile show for many months.

Marshall Merkes To Make Duesenbergs

Marshall Merkes, Chicago brass products manufacturer, announced recently in Indianapolis that he had purchased the inventory of Duesenberg parts and the remaining blueprints and other assets from the Auburn Cord Duesenberg Co., Auburn, Ind. He also announced that he had retained August S. Duesenberg, the man who engineered the old Duesenberg cars, to assist in the designing of new Duesenberg models, to retail for not less than $25,000.

Mr. Merkes said that it will take a year or so for development work on the proposed new models, and added that a group of Chicago men will join with him in the financing of the experimental work.

According to Mr. Duesenberg, the bodies of the new cars will be custom-built. The car will have an eight-cyl engine similar to the last Duesenberg engines, will probably have an injection-type fuel feed in place of the carburetor, and will follow the lines of the old Model J, which developed 265 hp unsupercharged, and 325 hp supercharged. It traveled 129 mph in high gear, and 104 mph in second gear. Present plans call for an annual production of 25 to 50 cars. A plant site has not as yet been selected. The Duesenbergs produced in the late '20's and early '30's, following the purchase of the company by E. L. Cord, sold for $11,000 to $25,000. Production was stopped in 1937.

Now 67 years old, August Duesenberg worked with his brother, Fred, who died more than 10 years ago. Together they became famous

throughout the United States and the world when their cars won races at the Indianapolis Speedway, the Grand Prix at Paris, and smashed records on other well-known automobile race tracks. The brothers scored many engineering firsts in automobile design. Merkes' company manufactures motorcycle parts, and he is credited with designing many accessories for motorcycles, some features of which may be incorporated in the new line of Duesenberg cars, which will be tooled from scratch, since the old Duesenberg tooling has been sold.

Nash to Make Trucks For Export Market

Production of the new Nash truck will begin sometime this fall, but only for the export market as a knocked-down cowl and chassis without cab, body or rear fenders. Initially production is being concentrated on the stripped-down unit in order not to divert sheet steel from passenger car production. Nash will defer production of complete trucks for the domestic market until sufficient steel becomes available.

Ford Using Aluminum Parts To Bypass Steel Shortage

During the current steel shortage, automobile manufacturers are turning to substitute materials for component parts. Ford is using an aluminum running board to replace the unit formerly made of steel. As a result, the company is saving 18 lb of steel a car, and has reduced the weight of the vehicle by 15 lb. Substituting aluminum for steel on headlamp housing effects a saving of 3 lb of steel a car, and the part is said to be rust proof and lower in cost. Ford currently has under study about 80 parts in which steel may be replaced by other materials. Aluminum suppliers claim that Ford can reduce steel requirements by at least 200 lb a car. The company admits that some substitutes are not economical from the cost standpoint, and will be used only until steel is again available in adequate quantities.

1948 Packard Super Eight and Custom Eight

A 145-hp straight eight engine powers the 1948 Packard Super Eight model, which is available in three body types on 120-in. wheelbases, and four body types on 141-in. wheelbases. The Club Sedan (top) is on a 120-in. wheelbase. The 160-hp Custom Eight Touring Sedan (bottom) has a 127-in. wheelbase. The Custom Eights are available in three body types on 127-in. wheelbases, and two body types on 148-in. wheelbases.

Clear View Convertible

Fabricated from Plexiglas, the Plexi-Top shown here is an accessory which fits over the retracted top, regularly furnished on convertibles. The regular top may be used at any time by detaching and removing the Plexi-Top, which is held to the body by five strong, simply-operated fasteners. Currently available for '42, '46 and '47 Ford and Mercury convertibles, the top is made by Plexi-Top, Detroit.

Machine Tool Show Automotive in Character

It was no coincidence that many of the 2000 pieces of equipment strikingly displayed at the Machine Tool Show, in the Dodge-Chicago plant in an open area of some 550,000 sq ft were distinctly automotive in character. The essence of the show in the words of H. H. Pease, president of the National Machine Tool Builders' Assn., was "cost reduction." No other industries in the world are so conscious of cost reduction and so impatient to take advantage of the techniques of increased productivity as the automotive. Close study of the offerings of machine tool builders, it is believed, will convince automotive managements that this post-war equipment effectively makes obsolete much that is now in general use. Not only was the machinery of mass production character, but many of the displays were tooled to machine typical automotive parts such as axle shafts, crankshafts, camshafts, and gears.

A few examples chosen at random will emphasize some of the unusual features presented. In the Fellows Gear Shaper booth, visitors

were astonished to see an enormous turntable gear shaper, in operation, composed of 10 individual gear shapers, each one tooled for an entirely different type of gear. Pratt & Whitney marked the first showing of its strikingly new Keller machine for body and sheet metal dies, a unit weighing over 100,000 lb. Neither size nor weight were as impressive as the statement that this machine will produce large dies in one-third the time formerly required. Gisholt exhibited crankshaft machining techniques by the introduction of its Turn-Mill, in which a crankshaft, for a popular six cyl passenger car, has all six pins and adjacent webs turned from the rough in one setting in a fraction of the usual time. The new model of the Gleason Revacycle machine for rapid and automatic production of differential side gears and pinions has some additional features including a gear tooth burring attachment which is a part of the circular tool.

All machines have been improved in appearance and have had special attention to simplify service and maintenance. In keeping with the need for greater productivity, the new machines are more rigid, have greater power, and are capable of speeds, feeds and depth of cut that take full advantage of the available cutting tools, such as the varieties of cemented-carbides, Stellite, etc.

Cemented-carbides have come a long way. For example, Carboloy showed some varieties capable of drilling granite blocks without deterioration and demonstrated formulations being used for progressive punching dies. It was of interest to find that Barber-Colman is now offering a commercial hob with cemented-carbide inserts for gear hobbing. Big hobs of this type were used during the war but even a year ago it appeared that the practice could not be applied to hobs for automotive gearing.

Studio on Wheels

Custom built to radio station WJR's specifications, this mobile studio was produced by the Flexible Coach Co., Loudonville, O. Broadcasting from a studio compartment which measures 9 ft by 6 ft by 8 ft, an FM transmitter relays the broadcast to Detroit for transmission through regular channels.

Dearborn Motors Buys Wood Brothers, Inc.

Dearborn Motors Corp. announced recently that they had purchased Wood Brothers, Inc., farm equipment manufacturing business, Des Moines, Iowa. Wood Brothers employed 800 persons.

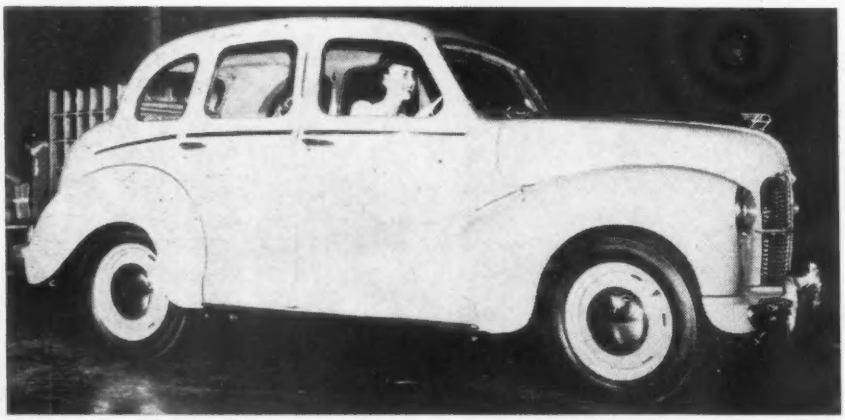
K-F Stepping Up Engine Horsepower

Kaiser-Frazer engineers are quietly at work to step up the horsepower of the Continental engine used in K-F cars. However, no details of what steps will be taken to increase power output have been revealed. K-F is producing from 75 to 80 per cent of its own engine requirements at its engine division in Detroit. It is known, however, that in order to increase production, the company has incurred some very high costs, and has now informed workers that unit costs will have to be reduced if production is not to be moved elsewhere. Union officials are said to have agreed to cooperate.

Form Company to Get Convair Non-Aviation

Implementing its long range expansion plan in the durable consumer goods field, Avco Manufacturing Corp. will dispose of a substantial amount of its stock interests in the Consolidated Vultee Aircraft Corp. and at the same time acquire a substantial interest in a new corporation, which will be organized to acquire the non-aviation properties of Convair. The new corporation will acquire the Convair Nashville Div., a 48 per cent interest in ACF-Brill Motors Co., and its wholly-owned subsidiary, Hall-Scott Motor Co.

Resuming the graveyard shift, Convair is now working around the clock, employing over 8000 persons.



Austin's Devon

Previewed recently in New York by the Austin Motor Co., Ltd., the Devon is powered by a four-cyl engine that is said to develop 40 hp. With an expected price tag of about $1495 delivered in New York, Austin hopes to tap the low-priced car market in the U.S. and Canada. Acme Photo.

Orders for 177 two-engined Convair-Liners from domestic and foreign airlines are reported to have been received by the company.

Ford Soft Metal Dies For Small Stampings

Further details about the soft metal process used by Ford for making experimental dies indicate that the method has been very successful thus far when used to make small pieces. The company is not yet prepared to say how far it can go with the process so far as larger sizes are concerned. It is particularly valuable in making dies of intricate shapes. The soft metal dies are said to withstand pressures up to 20,000 psi, which is considered adequate for experimental purposes. The metal itself is a compounded alloy of bismuth, tin, cadmium and lead, manufactured under the trade name of Cerrobend. Another alloy called Cerrotru, composed of bismuth and tin, is said to give even greater accuracy than Cerrobend. The dies are immersed in liquid nitrogen for only a few minutes which hardens the metal enough for from six to ten impressions before rechilling is necessary.

Edward F. Fisher May Invest in Gar Wood

Although the Fisher brothers have been reported to be interested in various automotive enterprises since they left General Motors, the first real indication of any interest by any of the brothers is an announcement in Detroit that Edward F. Fisher has entered into a conditional agreement to invest $1.5 million in Gar Wood Industries, Inc. The report came in connection with announcement that the company is planning issuance of $1,650,000 in five year notes, convertible into common stock at $5 a share. In addition to the $1.5 million invested by Mr. Fisher, $150,000 will be invested by C. W. Perelle, Gar Wood president. They would receive notes subordinate to all other debts of the company it is stated. Approval of stockholders would be required before issuance of any additional common stock, under the plan.

Use German Equipment to Get Oil and Gasoline From Coal

The Bureau of Mines is experimenting with German methods of obtaining oil and gasoline from coal. Several pieces of German wartime equipment, largest of which is a hydrogenation process converter weighing 130 tons, are being reassembled by the Bureau at the Missouri Ordnance Works, Louisiana, Mo. Equipment being used in the experiments includes the 60 ft cylindrical converter, a 10 by 18 ft gas synthesis process converter and a 4 by 60 ft *wickelofen* heat exchanger, each weighing 60 tons; and two 6 by 30 ft coal paste injectors weighing 30 tons each. Some 580 drums of hydrogenation-process catalysts and several additional drums of vapor-phase hydrogenation catalyst also are being tested by the Bureau at the Missouri works. In addition, the Bureau plans to reassemble a Linde-Frank oxygen plant unit. Other equipment received includes a De-Laval centrifuge and special purpose valves, fittings, gaskets and instruments.

Postpone Paris Car Show To October 23-November 5

Because the European Economic Congress has not completed its work and still needs the use of a portion of the Grand Palais, the Paris automobile show has been postponed to Oct. 23-Nov. 5. The Congress asked for an extension of three weeks, and this was granted. Thus, for the first time in its history the Paris show will not be held on the advertised date because an international body is occupying about one-tenth of the exhibition hall. Meetings and trade conferences fixed for the show period have all been postponed. The 20th Anniversary Meeting of the Société des Ingénieurs de l'Automobile will now be held Oct. 25-28.

Chrysler Chief Builder Of Marine Engines in U. S.

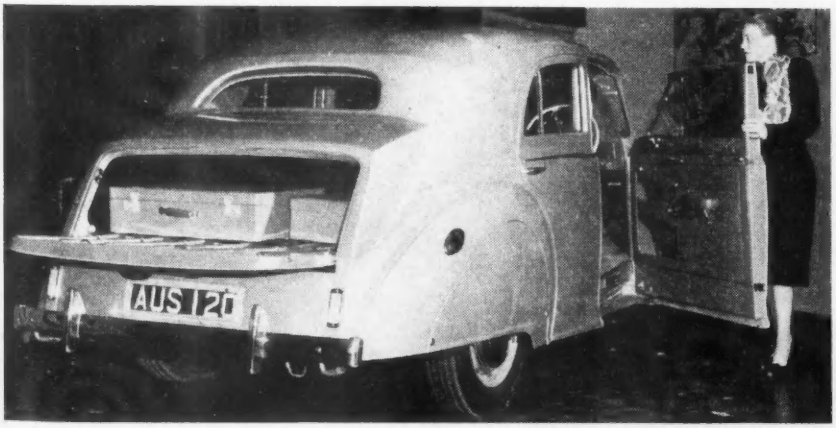
In a report to stockholders, Chrysler Corp. reveals that it is currently the largest manufacturer of marine engines in the United States, and is among the four leading producers of industrial engines. During the past twenty years, Chrysler has built and sold more than 245,000 marine and industrial engines.

Navy Special Devices Group Awards General Motors Corp.

General Motors Corp. recently received the first annual Distinguished Service Award to be presented by the Special Devices Association, composed of Naval Reserve officers and civilians who have served in the Special Devices Center, Office of Naval Research, U. S. Navy. The 1947 award went to GM in recognition of "the outstanding accomplishment in its scientific programs involving rapid learning techniques and mass training."

K-F Grants Contract for Car Assembly in India

Kaiser-Frazer Corp. has awarded a contract to Motor House, Ltd., Bombay, India, to assembly knocked-down units of Kaiser and Frazer cars in that country. A new $750,000 assembly plant, owned, operated and managed by residents of India will



Luxury Austin

Designed especially for the American market, the Princess is one of the four pre-release 1948 British Austins recently exhibited. The Princess has a custom body of steel and aluminum, a six cyl, 140 hp engine and is expected to sell from $4,500.

NEWS of the AUTOMOTIVE INDUSTRIES

Freight Via Highway and Skyway

Something new in air freighters is this Miles M68, with detachable cargo container, recently announced by Miles Aircraft, Ltd., Reading, England. Fitted with removable road wheels and a towing bar, the container, which is 10 ft long and has a height and width of 4 ft 6 in., can be used as a road trailer when the plane has landed. With a payload of 1600 lb, the M68 has a cruising speed of 130 mph, and is powered by four Blackburn Cirrus Minor engines. British Combine photo.

start to assemble about 200 cars a month next February. K-F will supply technical assistance at the start of production. It is also reported that the company is planning assembly plants in Austrialia and Canada, and also is said to be considering right hand drive cars for export to South Africa. K-F is currently exporting about 10 per cent of its total production.

No Change in Engine Size For 1948 Indianapolis Race

Speculation that the Indianapolis Motor Speedway would change its rules to reduce the size of supercharged engines ended recently with the announcement by Wilbur Shaw, president and general manager, that all of the supercharged cars in this year's race would be eligible for the 500-mi classic in 1948. Mr. Shaw stated that the present limit of 183 cu in. for supercharged cars, and 274 cu in. for non-supercharged cars assures a better show for the fans.

Ford Cuts Costs By Parts Analysis

Albert J. Browning, Ford vice-president and director of purchases, revealed in an address recently how the company is making progress in its cost-cutting campaign. Changing the size of steel used resulted in a saving of three cents a wheel in manufacturing cost. An additional one cent a wheel was saved through an improvement in painting technique. The supplier also suggested a design change on the rim which will save an estimated $64,000 annually. The cost of the 1947 steering wheel was reduced 19 cents by a simple design change. A saving of three cents a car resulted from the elimination of two slots on the hand crank ratchet. Mr. Browning said that activities of this kind are expected to save Ford at least $10 million a year.

Allis-Chalmers Producing Giant HD-19 Diesel Tractor

The giant Allis-Chalmers 20 ton HD-19 Diesel, said to be the world's largest, most powerful crawler tractor, is now in production at the company's Springfield, Ill., plant. A three stage hydraulic torque converter introduced into the power train has increased capacity and performance. Eliminating gear shifting, and shock resulting from master clutch engagement the torque converter reportedly assures longer life.

Guarantee Muffler For Life of Vehicle

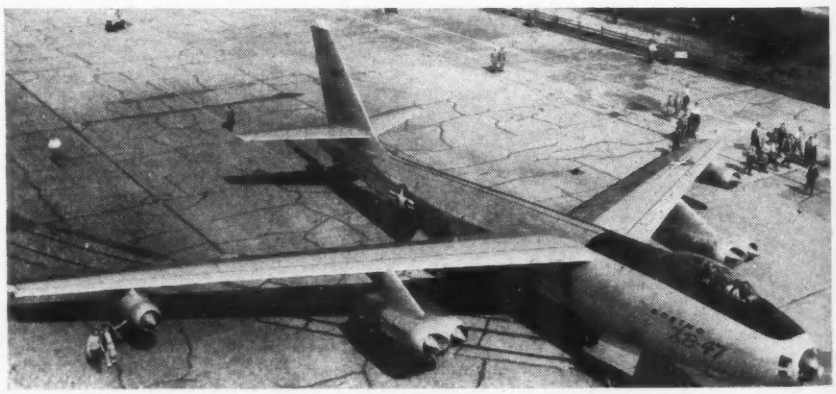
Of interest to the replacement parts industry is a report from Chicago that International Parts Corp. has instituted a new guarantee covering all types of mufflers. Since the first of August, the company has included with each muffler sold, an unconditional written guarantee that the muffler will not blow out during the life of the vehicle on which it is installed. The guarantee states that if the muffler does not give completely satisfactory service it will be replaced by the dealer, free of charge.

Aluminum Body For Chevrolet Trucks

A new package delivery truck body built on the monococque principle, eliminating interior upright braces, and made of aluminum alloy was presented to Chevrolet dealers in 14 Eastern states recently by the J.B.E. Olson Corp. Saving about 1000 lb by using aluminum instead of sheet steel, the bodies, designed by the Olson company, are being made by Grumman Aircraft Engineering Corp., Bethpage, N. Y., in two models.

Four Wheel Drive Auto To Boost Capitalization

Stockholders of the Four Wheel Drive Auto Co. have voted to increase the company's capitalization from $3 million to $6 million. Current backlog of orders exceeds $7 million. Robert A. Olen, general manager, says that trucks are now being



Six Jet Stratojet

Employing sharply sweptback wings and tail surfaces, used for the first time on any bomber, the AAF's Boeing XB-47 Stratojet is powered by six jet engines, designed and built by General Electric Corp. Wing span is about 116 ft, and length is approximately 108 ft. The tandem-type landing gear used permits exceptionally thin wings.

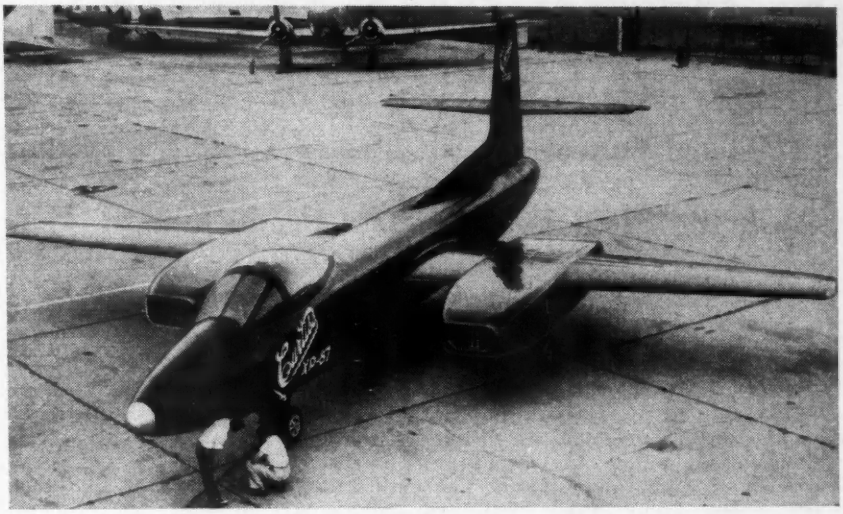
shipped to Europe via the St. Lawrence waterway with a saving to the customer of more than $600 a unit. He said the waterway transportation will be a material factor in increasing the company's export business.

Aluminum Gasoline Tanks For Kaiser-Frazer Cars

Developed by Kaiser-Frazer's Permanente Metals Corp., a new aluminum utility sheet will be used in various stampings to replace steel in its cars. The new aluminum sheet will be used first for gasoline tanks in K-F automobiles. The new seam-welded aluminum gasoline tank weighs seven lb, with a capacity of 21 gal, as compared with a steel tank weighing 22 lb. The new aluminum sheet designed to replace steel for many uses, was developed at the Spokane rolling mills of the Permanente Metals Corp.

Court Accepts Ford Stock Valuation of $89 a Share

Ending a long dispute between the Internal Revenue Department and the estate of the late Edsel Ford, Judge J. V. Trombly of Macomb County, Mich., Probate Court, has accepted valuation of approximately $89.28 per share on the Class A nonvoting and Class B voting common stock of the Ford Motor Co. The court accepted a valuation of $103,842,810 for the 1,163,509 shares of Class A stock and $5,346,990 for 59,411 shares of Class B stock. Under the terms of the will, Class A common stock and real estate valued at $148,487 were left to the Ford Foundation. The Class B voting common stock was left to Henry Ford II, Benson Ford, Mrs. Josephine Clay Ford, William Clay Ford, and Mrs. Edsel Ford. The settlement is expected to have a very helpful effect in hastening probating the will of Henry Ford who died last April 6.

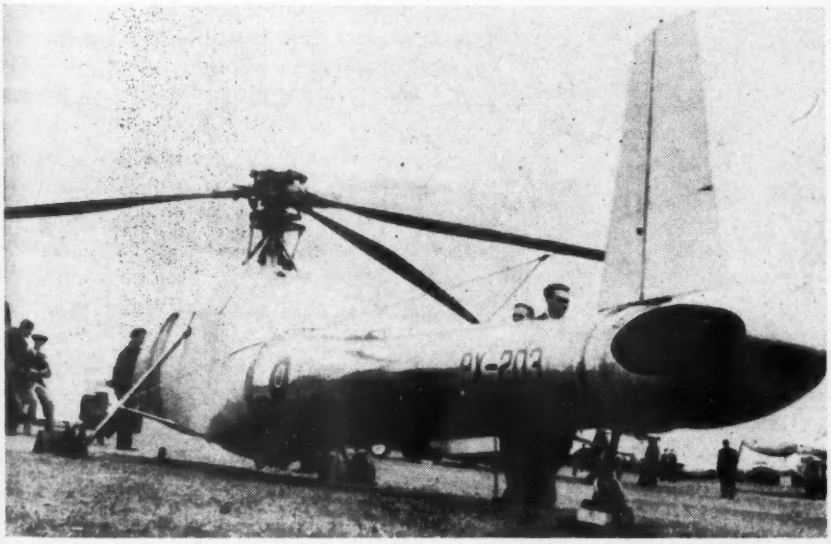


Four Jet Fighter

The first fighter to be powered by four jet engines, the Curtiss XP-87 is the AAF's newest fighter. With a wingspan of about 60 ft, and an overall length of 65 ft, the XP-87 is designed to operate under extreme weather conditions. Four Westinghouse jet engines power the plane which will be flight tested at Muroc Army Air Base, Calif.

Reuther Demands GM Pension Talk

Pension plan fever has again infected Walter Reuther, UAW-CIO president. He has called on General Motors to open discussion on a social security and old age pension plan for 250,000 production workers. He said that discussions of such a plan were authorized under terms of the present General Motors contract, but General Motors has not commented on the proposal.



Torque Correction by Jet

Featuring a jet torque corrector for experimental purposes, the Cierve W-9 helicopter was one of the exhibits recently demonstrated at the flying display which was staged by the Society of British Aircraft Constructors at Radlett, England. International News photo.

Metals

Copper

Almost all segments of the copper market are evidencing healthy demand; with October copper completely sold, some producers report getting orders for additional tonnages. An increase has been noticed in brass mill orders; strong wire mill demand continues, together with high copper tube and pipe demand; however, brass pipe and rod have been in excess supply for some time.

(*Turn to page* 85, *please*)

A Radically Different Method

Consolidated-Vultee's Use of Master Tooling Dock and Geometric Mastering System at Nashville Plant Permits Mass Production of Heretofore Custom-Built Product

By Leland A. Bryant
Production Engineering Consultant

This article presents a description of how the master tooling dock system has enabled the Nashville Division of Consolidated Vultee Aircraft Corp. to manufacture motor coaches on high volume basis. The master tooling dock, a positioning device which uses longitudinal, vertical and transverse straightedges to locate points accurately in space for constructing assembly fixtures, was first used during the war for mass production of military aircraft and was described in the September 1, 1944, issue of AUTOMOTIVE INDUSTRIES. Recently, the master tooling dock has been finding peacetime application to a variety of large structures, as exemplified by the precision tooling method used by Consolidated Vultee Aircraft Corp. in manufacturing the Convair Liner (see July 15, 1947 issue of AUTOMOTIVE INDUSTRIES), and now in the mass-production of motor coaches, which is its first motor vehicle application.

Since this article was prepared announcement has been made that a new corporation, in which the Avco Manufacturing Corp. will have a substantial interest, is being formed to acquire the non-aviation interests of the Consolidated-Vultee Corp., including the latter's Nashville Division, 48 per cent interest in ACF-Brill Motors Co., and wholly-owned subsidiary Hall-Scott Motor Co.—Ed.

1947 model 44-passenger city type coach just off the final assembly line at the Nashville plant of the Consolidated Vultee Corp. where military aircraft were built during the war.

EVERY leader in the automobile industry knows that mass production of complex products implies efficiency on the assembly line. Mass production is not something that can be brought about by wishful thinking or policy making at administrative levels. It is not something that necessarily begins to happen when mass production executive talent is brought in from other industries to take over the reins. Mass production of this kind is not something that comes about automatically. Mass production of motor coaches as well as all other large, complex products depends strictly upon appropriate means and methods through which interchangeable manufacture can be established and maintained through all operations.

The master tooling dock had its origin in the conception that nothing of a mechanical or structural nature could be of such size and complexity but that it must first be presented in accordance with the simple language of descriptive geometry. The objective underlying its invention was the provision of suitable means and methods for directly transposing the precise requirements of the designer from the second dimensional fixations of the loftsman into the third dimensional fixations of the tool maker.

Since, however, it had been developed initially for the mass production of military and naval aircraft in relative secrecy to meet wartime demands, it was not possible to present factual data as to its accomplishments during that period, and disclosures were limited to the mechanical characteristics of the master tooling dock itself. That complete mastering for interchangeable manufacture of many things should not have been devised within the framework of geometric rather than arithmetic principles

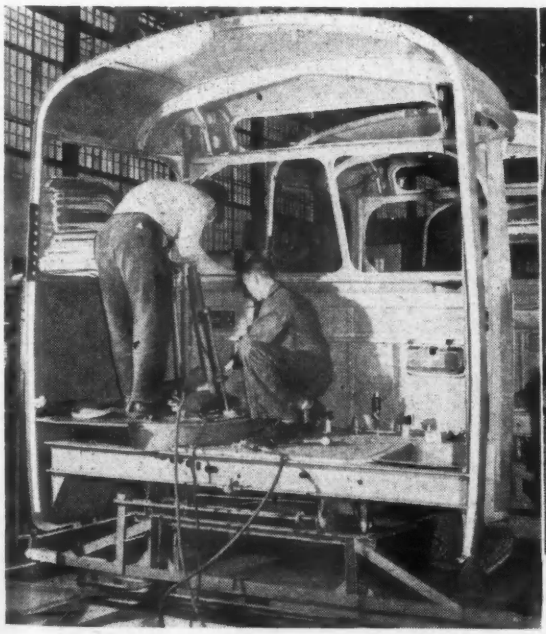
# of Building Motor Coaches

heretofore is the only thing that need arouse the wonder of the tooling and manufacturing world.

The master tooling dock, in conjunction with its related system of "geometric mastering," provides both the means and method for establishing the interchangeability essential for mass production of many products beyond the range of conventional tooling techniques. Unlike any other system, geometric mastering tends to actually reduce rather than increase the usual engineering and tooling costs in terms of both time and money. Also, geometric mastering plus the master tooling dock not only eliminates the need for dimensions and the use of all measuring apparatus at tooling levels, but it makes possible the employment of mechanics who have had no prior knowledge or experience in precision tooling. Geometric mastering is like all other mastering in the sense that only simple matching-up operations are required, but it differs from all other mastering in that costly gages are not required for tool making.

The Nashville division of Consolidated Vultee Aircraft Corp. is now producing a 44-passenger city-type motor coach using mass production methods made possible by mastering for interchangeable manufacture. This 1947 model coach is shown in the accompanying photograph. It was designed and developed by Consolidated Vultee under contract with ACF-Brill Motors Co., a subsidiary concern. In many respects it resembles ACF-Brill's smaller 36-passenger version which has been in production in Philadelphia since the summer of 1946. The end vestibules and exit doors of both versions are identical in design; but their under-frames, mid-body power plants and running gears are substantially different in both character and dimensions. Production methods used at Nashville differ radically from those used at Philadelphia. In the Nashville plant, production line methods similar to those used in the automobile industry are employed, whereas at the ACF-Brill factory assembly practices conventional to all custom builders have long been established and maintained.

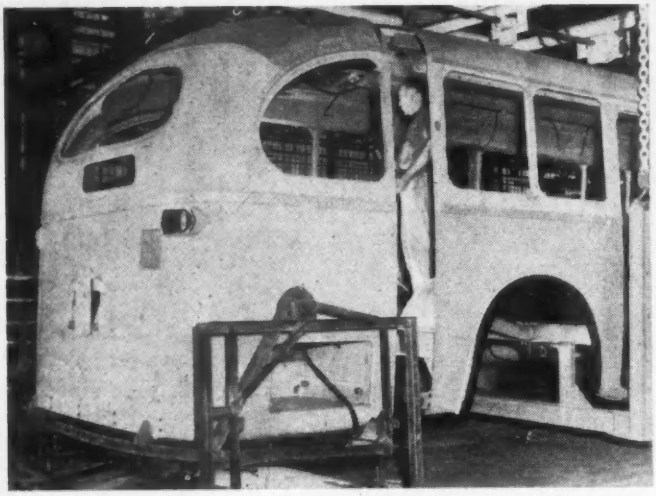
The pre-manufacturing breakdown and assembly tooling program at Nashville was directed by the consulting firm of Leland A. Bryant & Associates which holds patents rights to the master tooling dock and its related system of geometric mastering. A resident representative worked closely in coordination with Nashville management, and at all times there was the utmost harmony and singleness of purpose, despite the fact that the task was entirely new to that plant. In the following series of pictures on this page and the next three pages are portrayed the major manufacturing operations used in motor coach production at Consolidated-Vultee's Nashville plant.



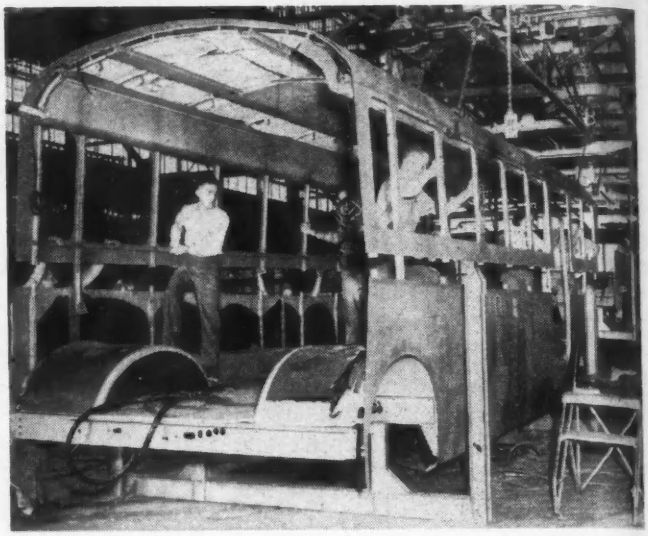
(Left) This photo shows installations being made at one of the stations of the front vestibule sub-assembly line. The structure, except for mastering of the junction between it and the mid-body and underframe, is being constructed by methods and assembly tooling identical with those utilized by ACF-Brill Motors in Philadelphia. The cleavage, however, has made possible a convenient access for the installation workers; and in this short line, all of the controls, instruments, wiring, lighting, destination signs and trim are readily installed by ordinary factory workers.

(Right) Here the front vestibule is being moved into place for mating. No cutting or fitting is necessary; the operations merely consist of bolting up and riveting around the periphery of the junction.

MOTOR COACHES—(*Turn to page* 26, *please*)



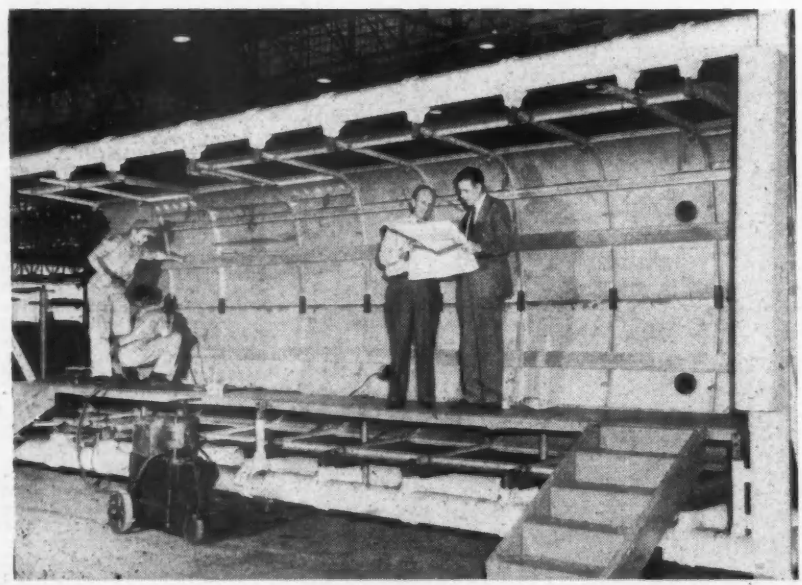
Mating of the rear vestibule shell, an operation similar to that for the front vestibule, and at the same station on the main line.



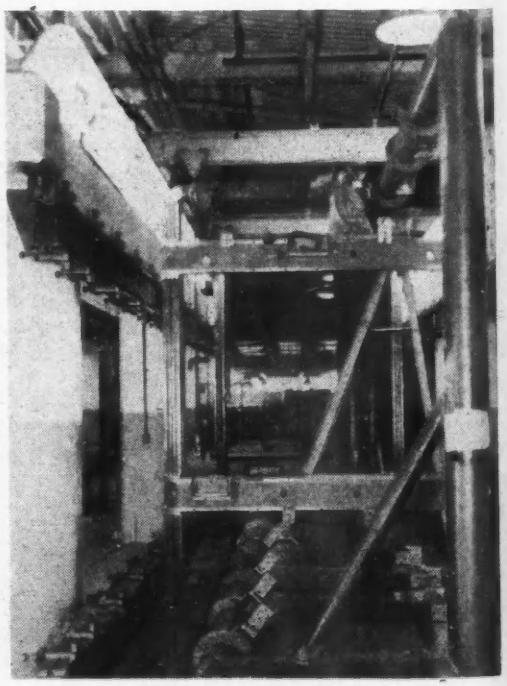
Mating of the upper mid-body with its lower section just prior to the attachment of the vestibules. The operation here consists of lowering the one onto the other, and riveting the junction between the corresponding posts and skins. The structural integrity of the body posts was preserved by using a solid and close fitting slug inside the hat sections, a U shaped reinforcing clip outside the hat and two long steel rivets above and below the post cleavage and passing through the several members. All rivet holes were prereamed in detail fabrication and to a slip fit limit. The first mating effected at this station was found to be perfect.

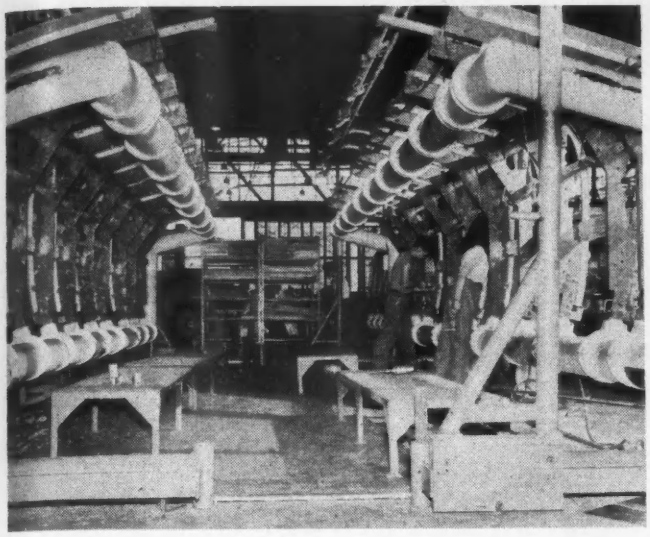
(Left) The upper mid-body installation line at an early stage in the plant set-up. The supply racks were not yet in place, and the prefabrication of the interior trim was still in development.

(Bottom right) Here the upper mid-body mating jig is being mastered in the tooling dock. The time required for setting all the locators was approximately eight hr, using a two man crew.

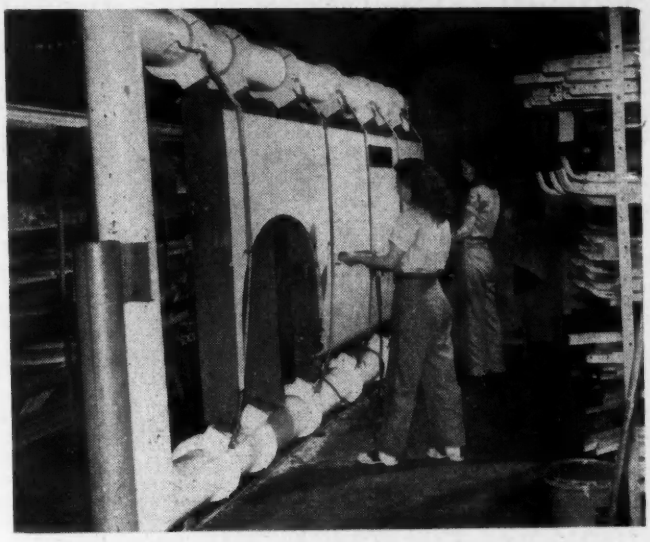


Shown here is the upper mid-body mating jig, in which the left and right sections are joined. The operation consists of riveting the center line seam and hat section splices. Each of the hat section posts is pinned to locators at top and bottom of this dock mastered jig. The platform on which the men are standing is hinged and counterweighted. A cycle time of less than 30 min. can be effected here.



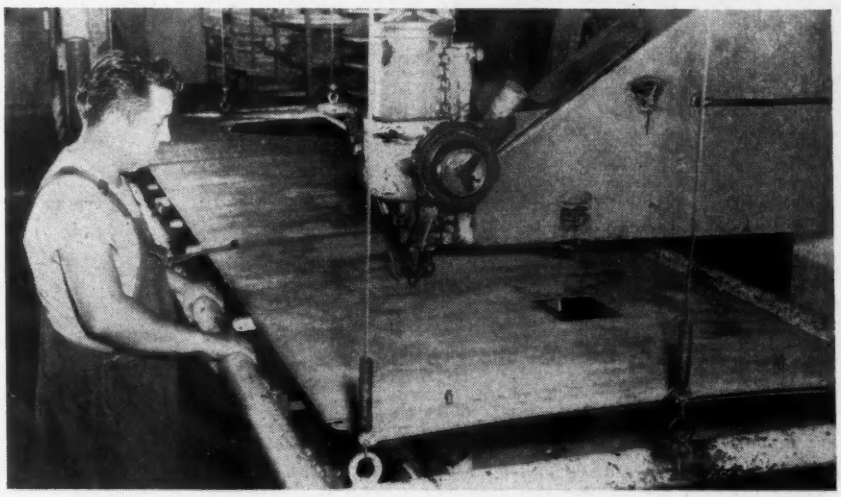


This view shows the pair of jigs used for joining the fore and aft panel assemblies used to produce the left and right sections of the upper mid-body. The operation consists of riveting the junction, and can be rapidly performed by semi-skilled labor after an hour or so of instruction. The hat section posts are pinned in their precise location as previously mastered in the tooling dock.

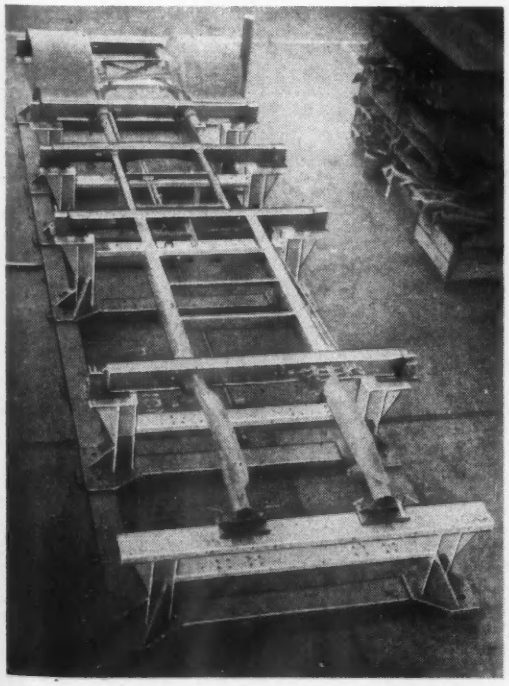


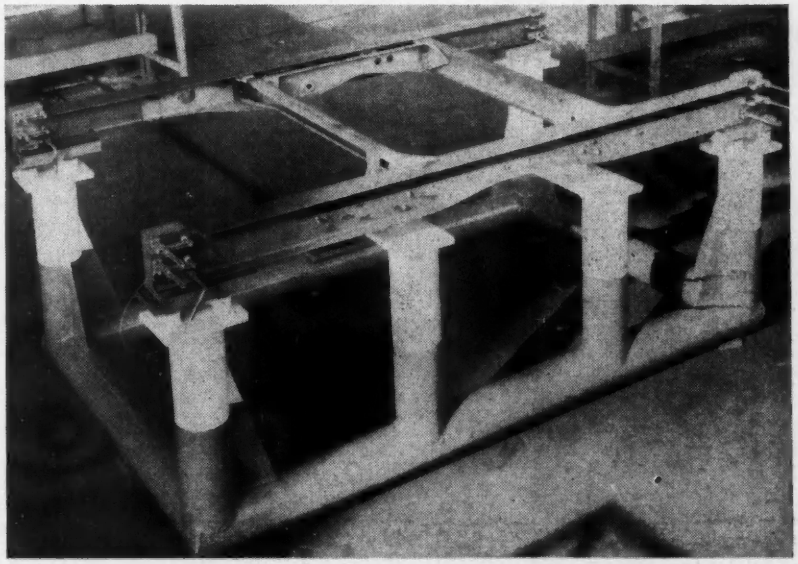
A typical mid-body panel—one of the lower side panels with wheel well cut-out. Note the mastered post section locators. The operation here, which is being performed by two young women, consists of nesting the parts in position and then tack riveting them sufficiently so that they may be transported to one of the riveting machines.

(Right) An operator riveting the mid-body panel on a semi-automatic Erco Riveter. Precisely uniform work can be produced by one man with approximately four times the speed that can be achieved by two skilled craftsmen using hand tools for the drilling and bucking of rivets.



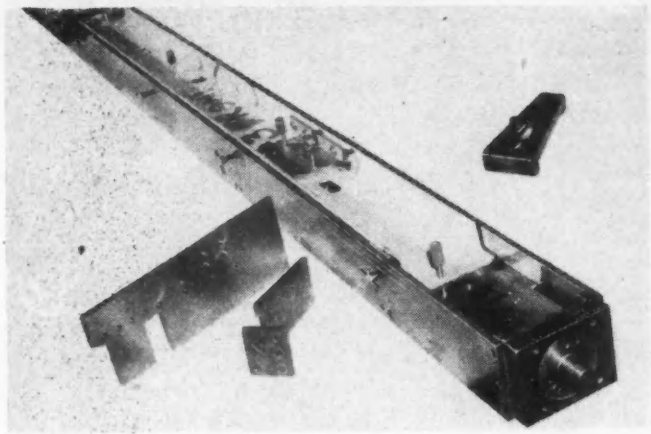
(Bottom left) The under-frame mating jig at the first station on the main line is shown here. Since the cycle time potential on the main line is first established at this starting station, the operations involved were reduced to riveting and welding the junctions between several large sub-assemblies. Note that the predrilled crossings are precisely located in this fixture in order that they will mate precisely with the cripple posts in the lower side panel assemblies. Since this jig was constructed in its final position, it was necessary to employ a dock-set master gage for the purpose of insuring coordination. A tolerance limit of 0.002 in. over distances ranging up to 25.0 ft was readily held.



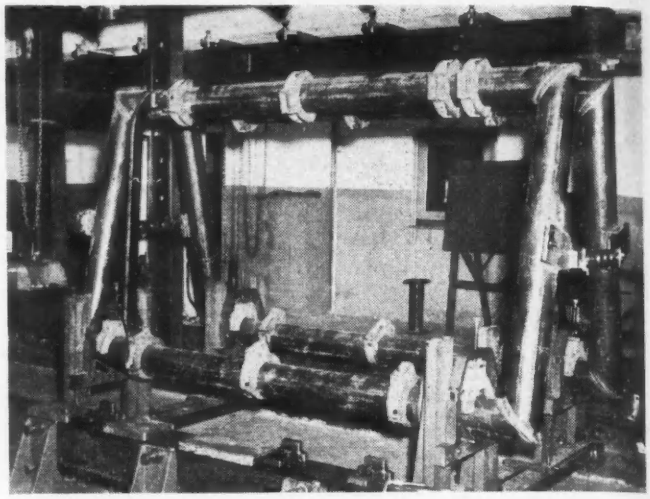


One of the sub-assemblies of the under-frame in a dock-mastered jig. The locating pins for the attachment holes in the crossings are conspicuous. The operation consists of bolting the longitudinal framing members through coordinate holes in the crossings and welding the gussets which join them.

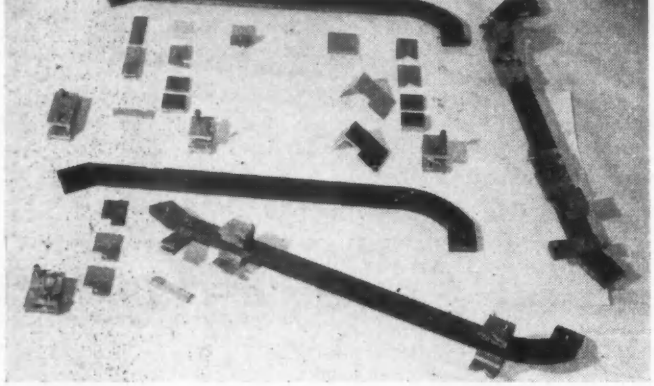
MOTOR COACHES—(*Turn to page* 28, *please*)



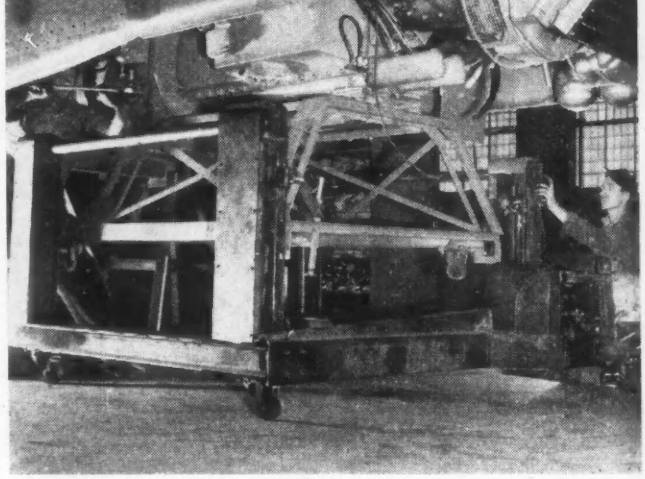
Typical drill jig for one of the crossings, removed from its trunnion stand. This jig was mastered with templates produced directly from engineering loft, as were all other drill jigs used to establish and maintain coordination throughout the assembly of the mid-body and under-frame.



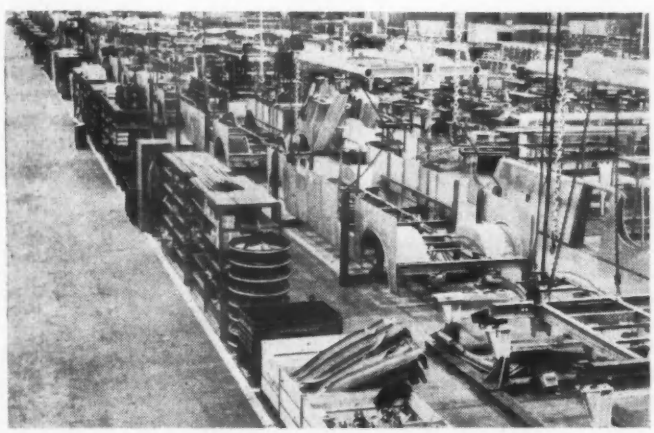
Typical assembly jig. The left and right hand pair are set up in position for mastering in the tooling dock. These can be set simultaneously in less than a single shift by a crew of two men.



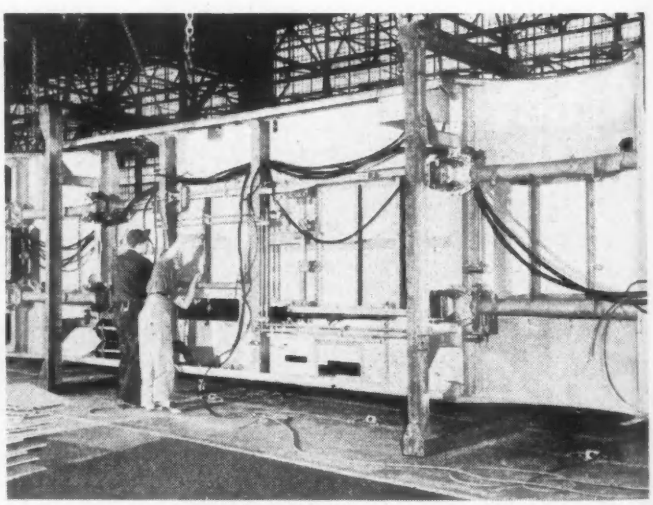
This photo shows the detail parts required for bench assembly of a typical station locator of an assembly jig. All of the elements are mastered directly from engineering loft by means of templates. Where identical steel parts were required, a sample unit was first produced in steel and hardened so that it might be readily used as a drill and saw jig. The master template for hole coordination is shown at the top of the illustration, and the completed assembly is shown at the right. The assembly jig itself is completed outside the dock by mounting the locator assemblies upon the dock-set attachment pads. The majority of all engineering changes can be made by bench work of this kind, and almost as fast as the information can be derived from the altered loft.



The equipment used for elevating and attaching the heavy under-gear and engine installations is illustrated here. The complete coordination obtainable through mastering makes it possible to perform the lifting and bolting-up operations in a matter of minutes. This photo shows the power plant being installed.



This view was taken from a position adjacent to the starting station on the main assembly line, and at an early phase in the plant set-up. The work is supported from an energized mono-rail on carriages which permit rotation of the under-frame and side panel combination to facilitate under-floor installations.



Main structure in rotated position for underframe installation.

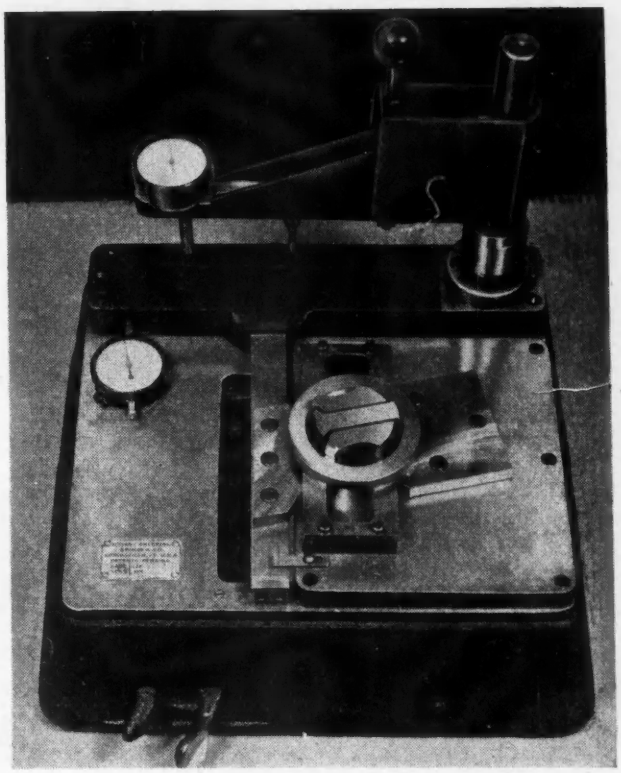
How Statistical Quality Control

Is Being Applied at Timken-Detroit Plant

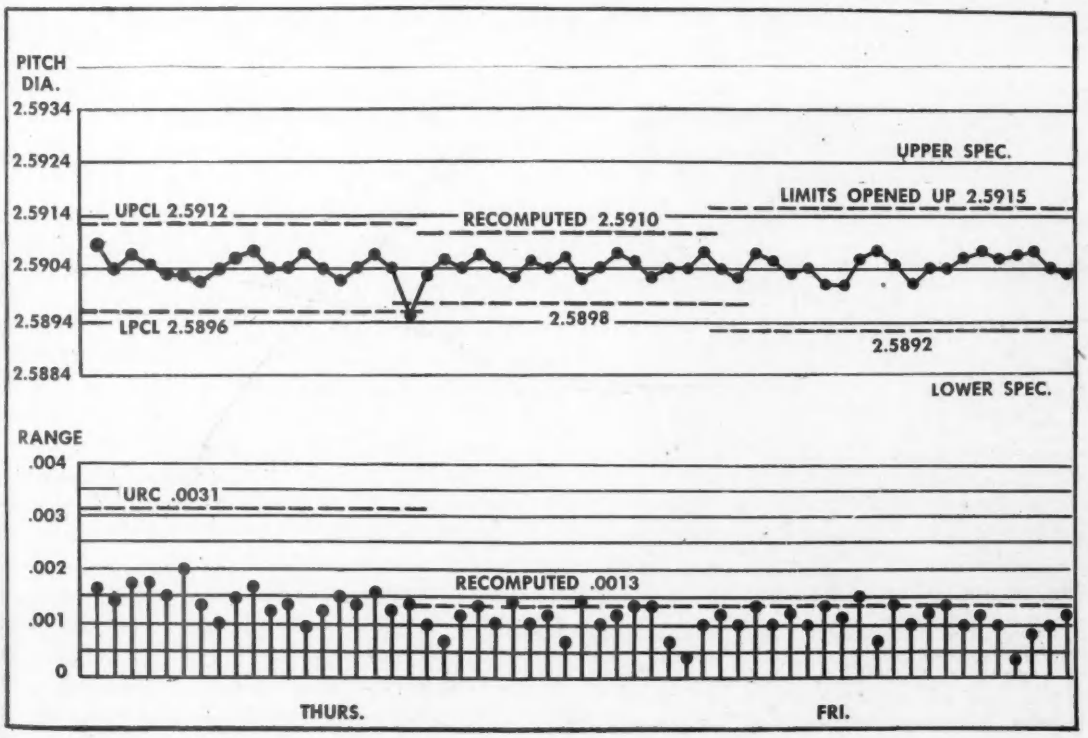
EXTENSION of statistical quality control to 11 departments, involving more than 100 processes, has been completed at the Timken-Detroit Axle Co., and by the end of this year it is planned to have the system installed in all departments. According to Timken, statistical quality control has been found to yield the following results: it improves quality by holding variations within closer limits; virtually eliminates hazard of improperly made parts entering into an assembly; improves quality by giving machine operators greater confidence in their work; lowers costs by speeding up assembly; lowers cost by reducing rejects and wasted man and machine hours; lowers overhead burden by calling for repairs when needed and only when needed; points to the specific cases where 100 per cent inspection is essential.

With the introduction of this technique Timken also improved its inspection procedure by the installation of the latest types of gaging equipment and instruments to assure accuracy as well as gaging speed. Timken has found one of the most valuable aspects of the new technique to be that the control chart is capable

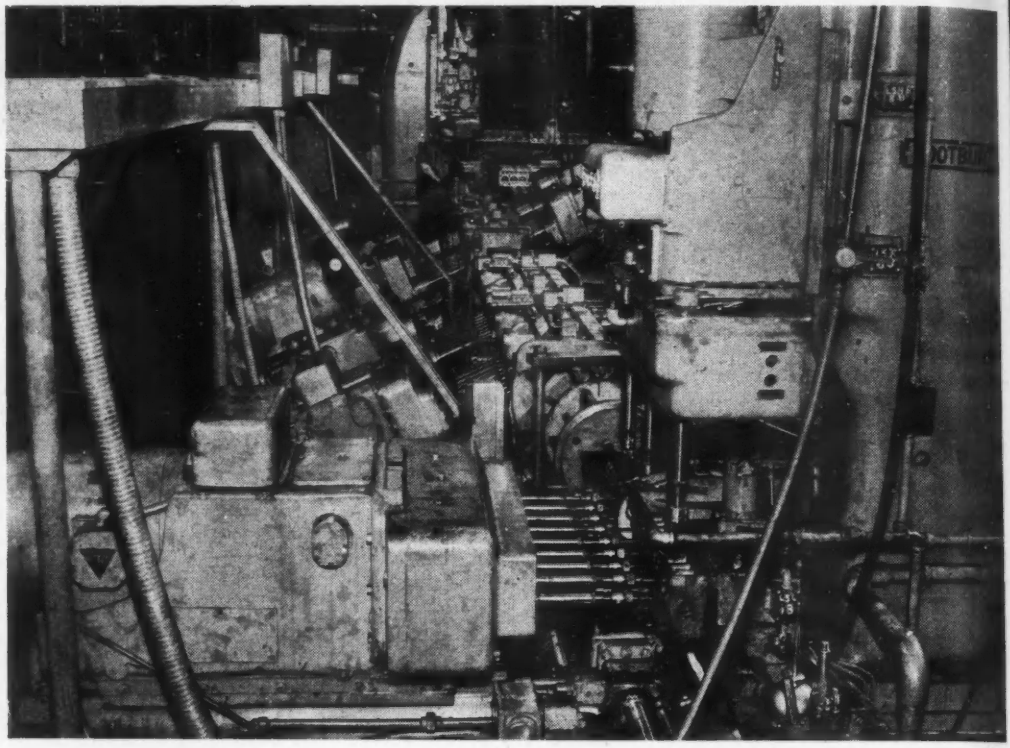
(*Turn to page* 64, *please*)



(Right) Fig. 1—New type of thread gage developed at Timken for checking wheel adjusting nuts.

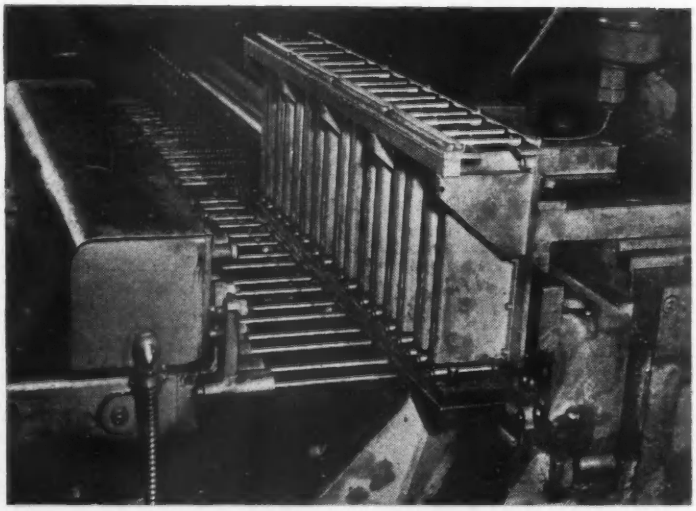


(Left) Fig. 2—Timken quality control chart picturing the trend in dimensional variations in wheel bearing adjusting nuts at the end of a three week control period. Complete control has been established at this point.



Perspective view of one of the coordinated units of the Foote-Burt transfer line for drilling and tapping Buick cylinder heads

Independent Units Protect Automatic Transfer



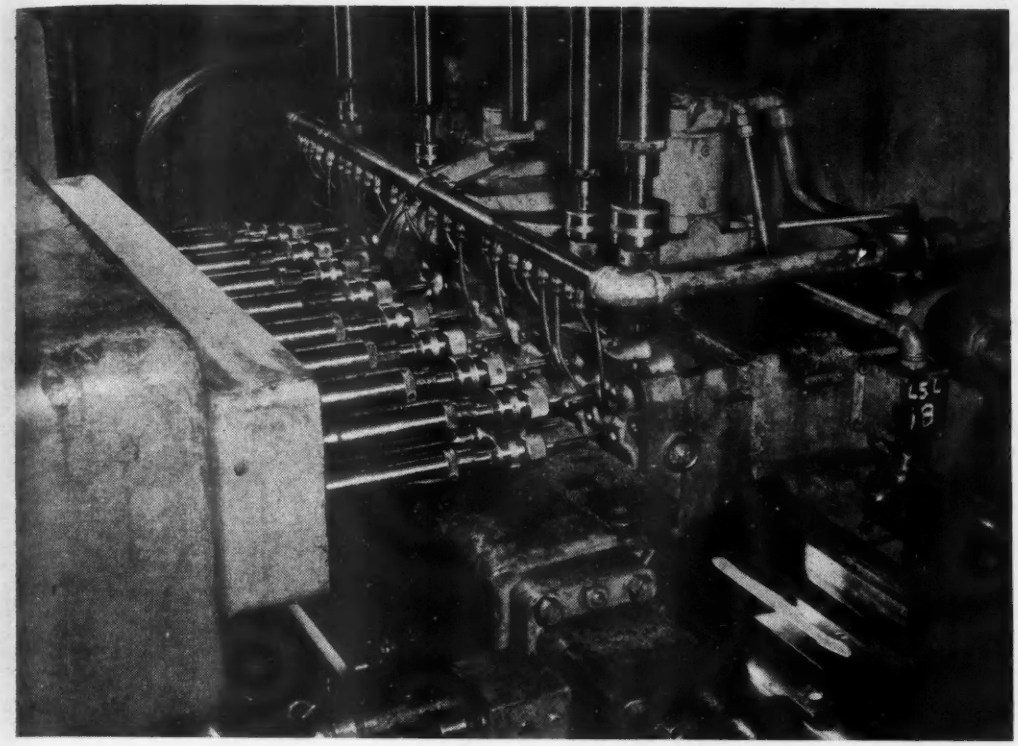
This is the Oilgear hydraulic press for inserting the 16 valve guides in a Buick cylinder head in one setting. It has two stations: one fitted with a set of 16 small brushes which move into the bores to clean them; and the other fitted with 16 rams which press-in valve guides fed from an overhead hopper.

By Joseph Geschelin

WHEN the first announcement of Buick's program of advanced transfer machine lines was made in AUTOMOTIVE INDUSTRIES, Feb. 1, 1947 ("Buick Cylinder Blocks Now Machined on First Unitized Transfer Line"), similar setups were contemplated for other elements of the Buick car.

Other manufacturers in the automotive industry also are equipping their plants with transfer type machine tools. One of these installations, that of the Detroit Gear Division, Borg-Warner Corp., will be described in the second part of this article.

The next major unit to be tooled at Buick



Close-up of the tapping station of the Foote-Burt line at Buick, showing the work in place on the conveyor station

Lines

Buick's Cylinder Head Setup Consists of Four Foote-Burt Machines, Each Having Six to Nine Stations. Another Installation with This Advanced Type Equipment Built by Barnes—the Transmission Case Line at Borg-Warner's Detroit Gear Division Plant—Is Described in Part II of This Article. Also of Particular Interest Are the Oilgear Valve Guide Press, Allis-Chalmers Induction Heating Machine, Michigan Tool Shear-Speed Gear Shaper and Baush Five-Station Machine.

for transfer line technique was the cylinder head and this first part of the article is concerned with the Foote-Burt equipment now in full operation there. Although the Buick master mechanic's department is fully sold on the transfer machine principle, a degree of conservatism has prevailed to the extent of breaking up the fully mechanized line into a number of independent automatic stations. In the event of operating troubles or tool repair on any unit, this arrangement makes it possible to operate the other units without interruption. The same philosophy prevailed when the cylinder block line was developed.

Accordingly, the cylinder head line consists of four independent Foote-Burt units, each comprising a number of stations, the first unit containing nine stations with a total of 118 spindles. The line is designed specifically for drilling, reaming, counterboring, and tapping the multiplicity of holes in the cylinder head of the well-known valve-in-head engine. In preparation for these operations the castings are milled top and bottom in conventional multiple-station Ingersoll heavy duty mills fitted with rotary indexing tables. Operations in the first nine-station machine are as follows:

First station: Load.

Second station: Horizontal head (left)—Drill 22 bolt holes part way; Horizontal head (right)—Drill 22 bolt holes part way.

Third station: Vertical head—Drill 11 holes in manifold face; Horizontal head (right)—Ream two locating holes.

Fourth station: Idle.

Fifth station: Horizontal head (left)—Drill eight exhaust guide holes part way and eight intake guide holes through; Horizontal head (right)—Mill water outlet boss.

Sixth station: Horizontal head (left)—Drill eight exhaust guide holes, through chamfer eight intake guide holes, drill two cover stud holes; Vertical head (right)—Counterbore four intake port holes.

Seventh station: Idle.

Eighth station: Horizontal head (left)—Drill 16 pushrod holes half way; Horizontal head (right)—Drill and countersink two holes in water outlet pad; core drill and chamfer plug hole in rear end.

Ninth station: Unload.

Since the situation at each junction is the same, it may be described briefly at this point. The unloading station (ninth station) is the point at which an operator removes the head from the machine, inspects it, then feeds it into the next unit. It is at this stage between machines that the automaticity of the cycle is broken. Within each unit the cycle of events is completely automatic. At this point there is stored a bank of heads from the preceding machine to permit the feeding of the next machine if anything happens to shut down the first unit. The same is done between each of the units now to be described.

One feature of the first unit deserves special mention. The right hand head of the eighth station is quite unique. A single horizontal head spans the machine and has a drilling station at each end for operations on the end pads of the head as described. Functionally, this head automatically moves outward to the right of the machine to permit the work to enter the station, then returns to position. At the proper moment the head moves forward to take one pad then reverses to take the one on the opposite end.

The second unit, a six-station type, handles the semi-finish and finish reaming of 16 valve stem guide holes, its operation beginning with the loading of a head in the first station. The valve guide holes are semi-finish reamed in the second and third stations; finish-reamed at the fourth and fifth stations. The sixth station is for unloading. At this point the operator inspects the work and places it in the first station of the third unit. This is a seven-station transfer machine for drilling, chamfering, and rough boring. The sequence is as follows:

First station: Load.

Second station: Horizontal head (left)—Drill 16 pushrod holes through; and drill two water holes; Horizontal head (right)—Drill 22 bolt holes through.

Third station: Horizontal head (left)—Drill two water holes; Horizontal head (right)—Drill 16 bracket holes and one oil line hole.

Fourth station: Idle.

Fifth station: Horizontal head (left)—Rough bore four intake and four exhaust throats; rough 20 deg seats; Horizontal head (right)—Chamfer eight exhaust guide holes, 16 bracket holes, two cover holes, and one oil line hole.

Sixth station: Horizontal head (left)—Rough bore four intake and four exhaust throats; rough 20 deg seats; Vertical head (right)—Drill and chamfer two cover holes, step drill and chamfer thermostat hole, drill oil line hole.

Seventh station: Unload.

At this point the work is again handled by an operator and loaded into the first station of the fourth and last unit—a nine-station, Foote-Burt transfer machine whose function is to drill, ream, counterbore, and tap eight spark plug holes and tap all holes.

First station: Load.

Second station: Angular head (left)—Drill eight spark plug holes; Angular head (right)—Counterbore large diameter halfway.

Third station: Angular head (left)—Ream eight spark plug holes; Angular head (right)—Counterbore large diameter to depth.

Fourth station: Idle.

Fifth station: Horizontal head (left)—Ream dowel holes and chamfer ten tapped holes in manifold face; Angular head (right)—Spotface and chamfer eight spark plug holes.

Sixth station: Horizontal head (left)—Tap ten manifold stud holes; Angular head (right)—Tap eight spark plug holes.

At the seventh station the head moves into a roll-over fixture and is turned over into proper position for the operations in the eighth station of this group.

Eighth station: Vertical head (left)—Tap one thermostat hole, two cover holes, one oil line hole; Horizontal head (right)—Tap 16 bracket holes, two cover holes, one oil line hole in top.

The ninth station is for unloading and marks the completion of the entire cycle of operations in the four main transfer units. The head is inspected by an operator and proceeds to the final step of pressing-in the valve guides.

This is done in an Oilgear hydraulic press of special design, differing from conventional machines of this kind in many respects. For one thing, the hydraulic head is horizontal rather than vertical, making the machine considerably more compact. It has two stations: the first position is fitted with a set of 16 small brushes which move into the bores and clean them out thoroughly in preparation for the guides. The press station is fitted with 16 rams, each of these being fed from an overhead hopper which is kept filled by the operator. His chief function is to feed valve guides as each ram operation is completed.

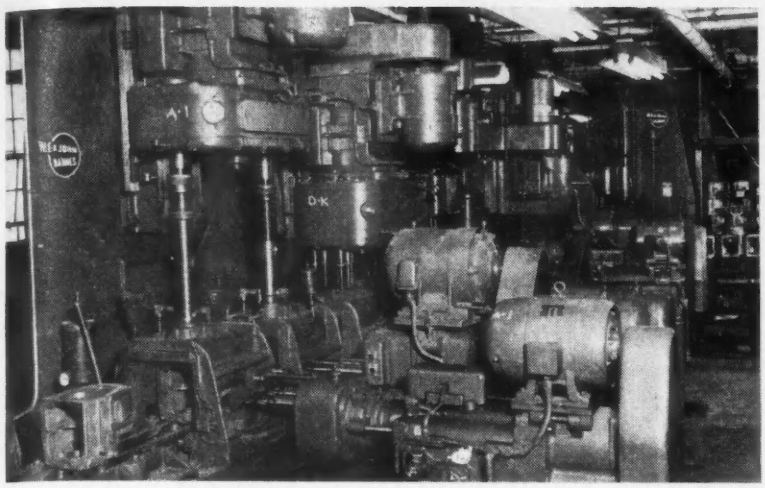
A noteworthy feature of this machine is the provision of a panel containing a signal light for each ram. The lights are hooked up with a mechanism for measuring the pressure required to fit each valve guide. If the pressure falls below standard—denoting a loose guide—the light flashes a warning signal. In such cases the operator marks the location of a loose guide, this being later withdrawn and replaced by one having the proper fit.

Although the cylinder head transfer line is relatively small and compact by comparison with the block transfer line, it does represent the latest thinking in transfer equipment and holds much of interest to production men of the industry.

Part II

Transfer Machines and Other Specialized Equipment at Detroit Gear Plant

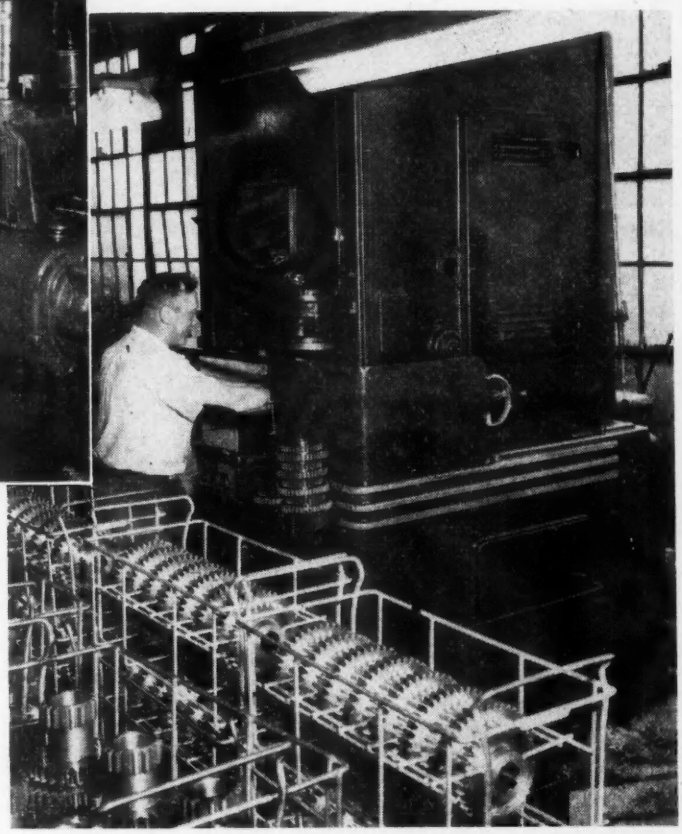
THAT prominent parts makers of the industry are keeping abreast of developments in modern practice is well illustrated in the advanced equipment installed by the Detroit Gear Division, Borg-Warner Corp. The Kercheval Avenue plant, devoted entirely to large



(Left top) Perspective view of one unit of the W. F. & John Barnes transfer machine at Detroit Gear for machining four-speed transmission cases.

(Left bottom) Close-up of loading station of the first unit of the W. F. & John Barnes transfer machine at Detroit Gear. Here the operator takes cases which have been finish-bored on the duplex machine and loads them into the first fixture of the transfer machine.

(Bottom right) One of two Michigan Tool Shear-Speed gear shapers in the Detroit Gear plant. They are used for cutting a shoulder gear on the cluster gear shown in the baskets. The operator loads and unloads gears at the station as shown.



volume production of four-speed truck transmissions, features not only a new transfer machine line for machining cases but also a number of other advanced machines of general interest.

In keeping with the fast developing trend to the adoption of transfer type machinery, the management has taken advantage of this technique in simplifying the processing of transmission cases and reducing overall cost by tooling the job on a small transfer line built by W. F. & John Barnes. This unit consists of two independent transfer machines, each one having 10 stations. Although some preliminary operations are performed on individual machines off the transfer line, the latter accounts for the major part of the processing.

Cases are prepared for the transfer line by milling in two Cincinnati 4-48 Hydromatic mills—the first machine taking the top and rear faces; the second, the front face and power take-off pad. Cases then go to a Barnes No. 412 horizontal duplex drilling machine for the following operations in one setting: Rough and semi-finish main bores; drill and ream in-line countershaft holes; drill reverse idler hole; drill and ream shifter hole.

The work is now ready for the transfer machine and cases are loaded one by one in the first station (loading station) by the operator. The following operations are performed automatically in the first unit of the transfer machine:

Second station: Undercut two snap ring grooves.

Allis-Chalmers induction heating machine at Detroit Gear used exclusively for annealing operations. The operator is annealing internal splines in cluster gears.

Chamfer 1/32 in. x 45 deg and face two inside bosses. Drill two 59/64 in. holes.

Third station: Finish line bore main bores to 3.328+.001—.000 in. diam and to 3.130+.001—.001 in. diam. Tap two ¾ 14 American standard pipe oil plug holes.

Fourth station: Drill two No. 16 (.177 in.) holes. Drill six 27/64 in. holes and one 5/16 in. hole. Drill three 21/64 in. holes; 25/64 in. counterbore ¼ in. deep three bosses.

Fifth station: Drill four "F" (.257 in.) holes. Spot face three one in. diam bosses.

Sixth station: Countersink six 27/64 in. holes and "F" (.257 in.) holes.

Seventh station: Tap two No. 12-24 x 5/16 in. deep holes. Tap six ½ NC holes. Tap three ⅜ NC holes (bosses).

Eighth station: Tap four 5/16 NC holes. Drill and countersink six holes for power take-off cover.

Ninth station: Finish line ream main bores to 3.1502 — 3.1497 in. and 3.3471 — 3.3466 in. diam and semi-finish ream countershaft hole .9957 — .9953 in. (front face only). Tap six ⅜ NC holes for power take-off cover.

Tenth station: Unload.

At the tenth station the operator examines the work, then feeds it into the first station of the second unit, succeeding operations being as follows:

Second station: Drill eight 21/64 in. holes. Drill six 21/64 in. holes for control cover (tower).

Third station: Countersink six holes and drill one 5/32 in. cotter pin hole. Countersink eight holes.

Fourth station: Drill 19/32 in. hole through second shifter boss and drill 61/64 in. hole through second reverse idler boss.

Fifth station: Mill two idler bosses to 6.923 — 6.929 in. and 1.28 in.

Sixth station: Line ream shifter rod hole to .6240 — .6230 in. and line ream reverse idler shaft hole to .990 — .989 in. and .9878 — .9862 in. diam.

Seventh station: Tap six ⅜ NC holes.

Eighth station: Tap eight ⅜ NC holes.

Ninth station: Line ream two .9995 — .9985 in. and 1.0025 — 1.0015 in. diam countershaft holes.

Two operations still remain after the work leaves the second unit—a clearance radius to be milled on the inside of the case in a 21 in. Cincinnati drill press; and one hole to be drilled, countersunk, and tapped in a two-spindle Leland-Gifford drill press.

Those familiar with the conventional method of processing a transmission case can appreciate how much time and floor space are saved by the introduction of advanced equipment such as that described here. In addition to other economies, an advantage of the new method lies in better quality control since the work proceeds automatically through mechanized fixture stations without the frequent handling and rehandling in fixtures by many operators tending a variety of machines.

Several other pieces of equipment recently placed in operation in this plant are worthy of special comment. One of these, of general interest, is the Allis-Chalmers induction heating machine used for annealing operations. As illustrated, the machine is equipped with induction coils for handling a variety of parts requiring annealing of internal or external sections. Certain gears have internal splines which are required

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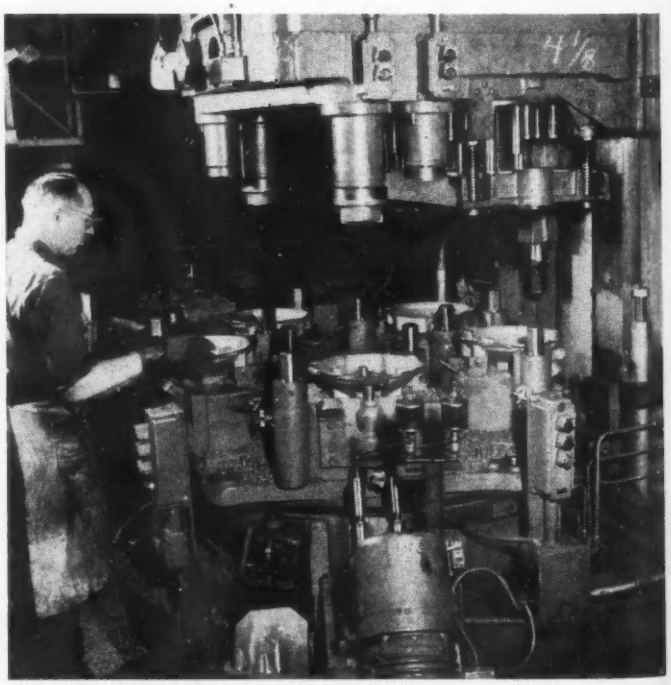
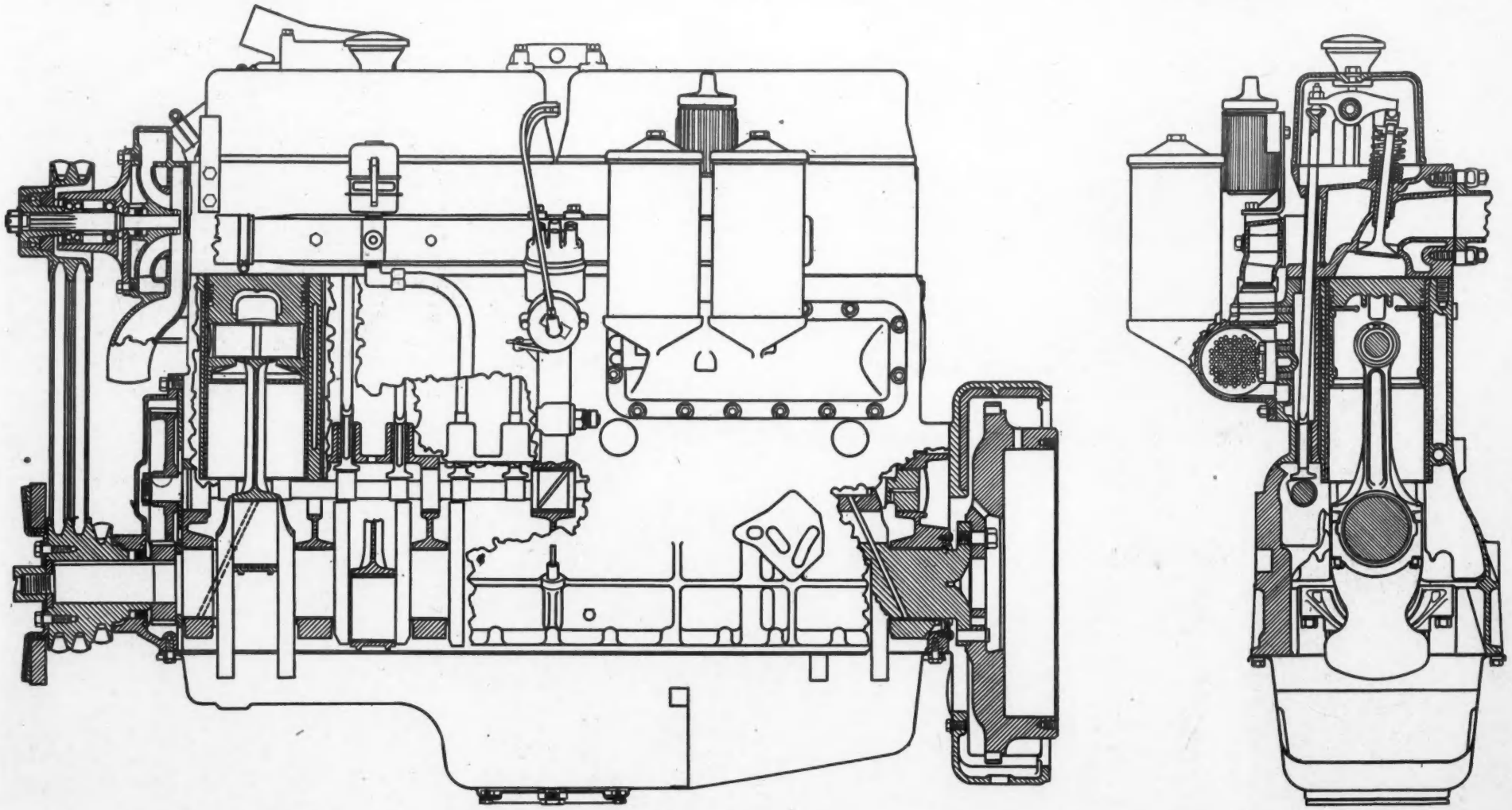
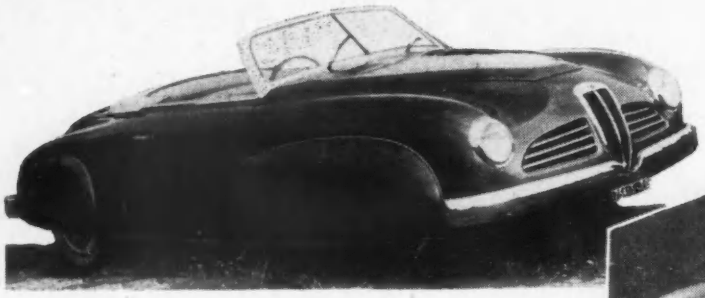


This enormous Baush multiple-head, five-station machine at Detroit Gear handles the machining of bell housings for the case mentioned in the text.

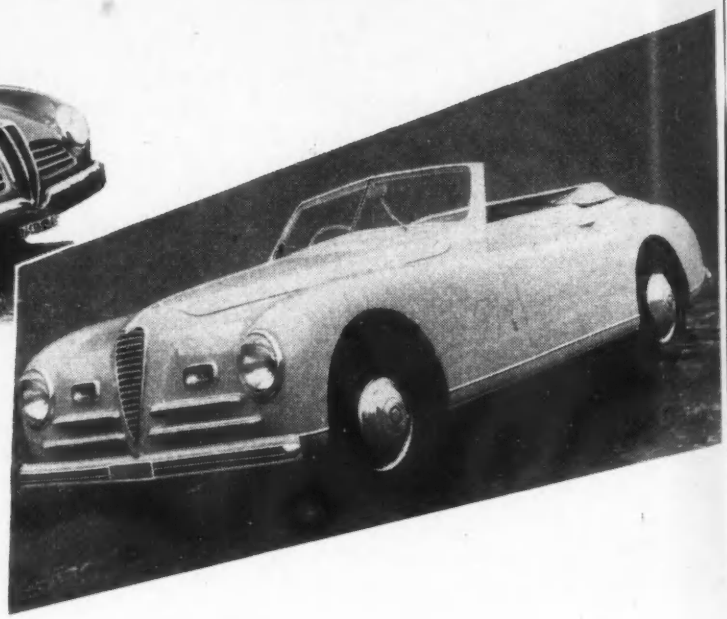
IHC's Western Model Truck Engine



Shown here in longitudinal and transverse cross-section is the Continental-built S-6749 six-cylinder truck engine which is used as standard equipment on International Harvester Co.'s Western models. This engine, complete details of which were given in the August 15 issue of AUTOMOTIVE INDUSTRIES, develops 246 hp (gross) at 2600 rpm and a maximum torque of 576 lb-ft (gross) at 1250 rpm. It has a 5.375-in. bore, 5.50-in. stroke and a displacement of 748.8 cu in.

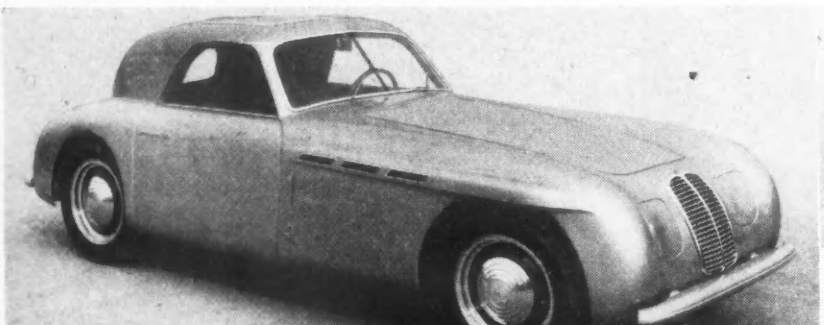


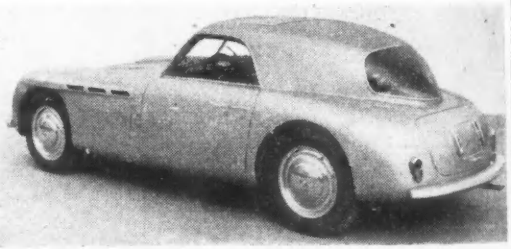
(Above) Pinin-Farina cabriolet body on Lancia Aprilia chassis.



(Right) Two-passenger Pinin-Farina cabriolet on super-sports Alfa Romeo chassis.

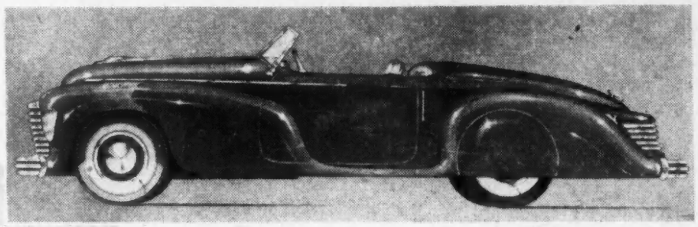
Latest Italian Customs





Sports coupe bodies by Pinin-Farina on Maserati chassis.

(Below) Four-passenger cabriolet by Pinin-Farina on Fiat chassis.



(Above) Two-passenger cabriolet by Boneschi. Note reproduction of front end treatment at rear.

(Left) Five-passenger cabriolet by Bertone on Fiat chassis.

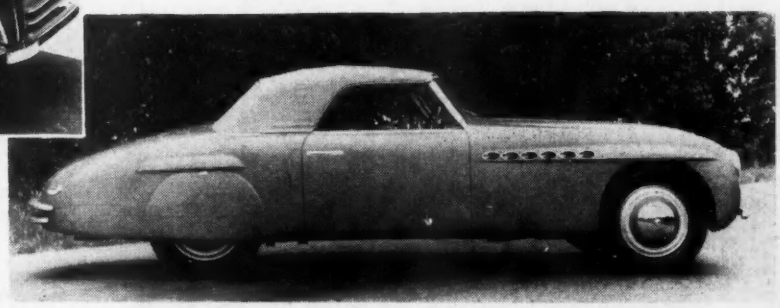
Styling . . .

Italian styling, as exemplified in the work of the specialized body builders, shows originality and a distinct breakaway from the lines followed by designers in other countries. More distinctive than the British, less ornate than the Americans, the Italian designs are pleasingly clean-cut and avoid the heaviness attached to many modern bodies produced in other quarters. The illustrations on these two pages show various types of styling from Pinin-Farina, Bertone and Boneschi factories. Sports type bodies are a strong feature of these new designs.

(Above) Two-passenger sports coupe with Plexiglas roof by Pinin-Farina on Alfa Romeo chassis.

(Above) Four-passenger cabriolet by Pinin-Farina on Lancia Aprilia chassis.

(Right) Three-passenger cabriolet by Pinin-Farina on Alfa Romeo chassis.



Gasoline Injection Truck Engine Converted from a Diesel . . . Gives Big Gains in Performance

A SIX-CYLINDER gasoline engine using fuel injection has been developed by J. I. Thornycroft and Co., Ltd., Great Britain. The new power plant, basically, is a Thornycroft NR6 Diesel model which has been converted to gasoline operation by changing the cylinder head, pistons and fuel injection equipment, and adding a 12-v ignition system. Apart from these units, all major components of the new gasoline-injection engine are interchangeable with those of the Diesel NR6. Specifications and performance of the new Thornycroft model, which is intended for use in commercial vehicles of 45,280 lb GVW, are given in the accompanying table. It develops 150 bhp at 1900 rpm and 445 lb-ft torque at 800 rpm as compared to 100 bhp at 1800 rpm and 337 lb-ft torque at 1000 rpm for the NR6 Diesel.

The gasoline injection equipment used on the new engine was developed by the C.A.V. Laboratories, and consists of an injection pump, automatic mixture control, excess fuel device for starting, feed pump, filter and injectors. The injectors are positioned vertically in the cylinder head with the nozzles located close to the inlet valves. Thus, injection of the fuel takes place directly into the port, and the nozzle is cooled by the incoming air. The injectors, shown in Fig. 1, are of the spring-loaded poppet type as originally developed for aircraft engines. They give a conical spray of an included angle of 30 deg. The opening pressure of the nozzles is only about 367 psi which is, of course, much lower than for oil engine practice. However, this has been found adequate to insure good atomization and mixing; and it has the added advantage of improving the reliability of the equipment.

To give a good atomized spray, the poppet nozzle has been designed to oscillate rapidly throughout the injection period. The valve has little inertia, and its lift is virtually unrestricted. The oscillations are caused by a combination of pressure wave phenomena in the pipe line and the natural frequency of the valve return spring. Once started, the oscillations tend to become self-sustaining, and the nozzle finally closes at a pressure lower than the opening pressure due to the differential effect caused by the poppet seat area.

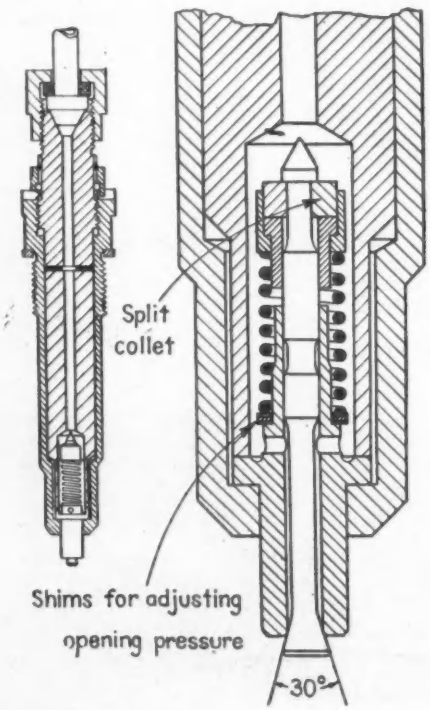


Fig. 1 — (Left) Sectional drawing of C.A.V. poppet injector

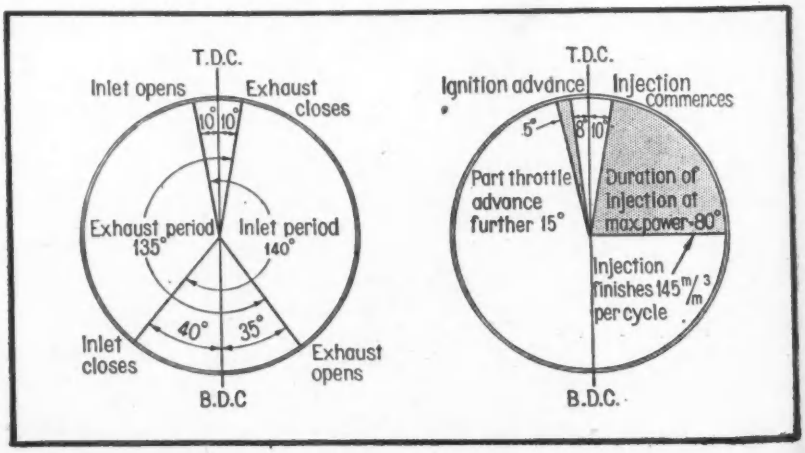
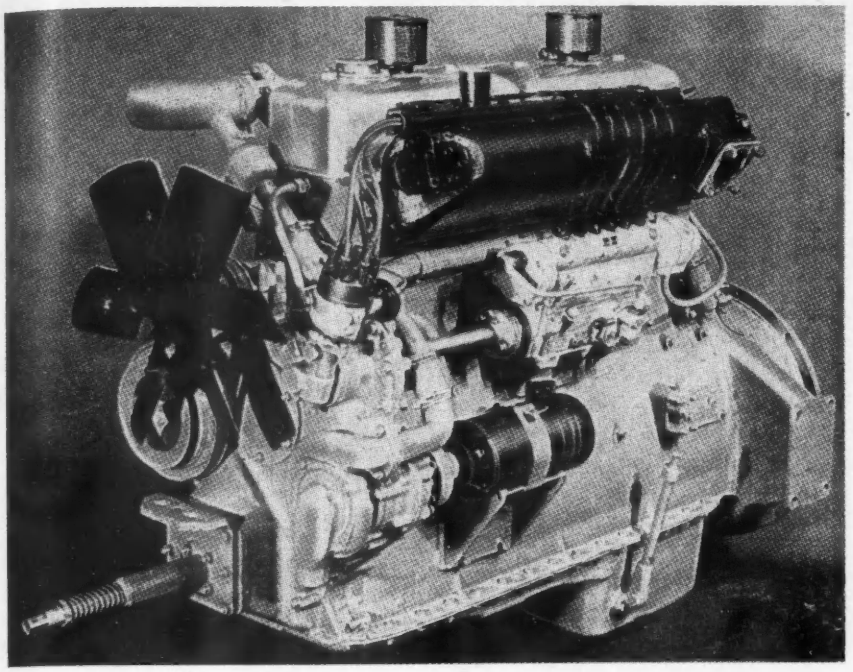


Fig. 2—Timing and injection diagrams for new Thornycroft gasoline engine



The Thornycroft 150 hp gasoline injection engine for trucks

The fuel-injection pump is basically a standard-type unit as commonly used on truck Diesel engines; it has a plunger diameter of 0.295 in. and a stroke of 0.394 in. However, a new camshaft is used, which has a profile designed to give a long injection period to promote good mixing of the fuel and air during the intake stroke. At maximum power, the injection period, as shown in Fig. 2, is about 80 deg of crankshaft rotation. The fuel is metered in the same manner as for standard Diesel engines, but greater accuracy of control is obtained by an increase in pump rod travel for a given output. This has been obtained by cutting the spill helixes of the pump plungers with a smaller pitch than is used for Diesel pumps. In other respects, the plungers and barrels are of standard design.

Since the injection pump responds directly to changes in engine speed, the problem of mixture control resolves itself into metering the cyclic output of the pump in accordance with the air-charge weight per cycle received by the engine. Variations in exhaust back pressure and ambient air temperature are ignored in order to obtain a simple and reliable control. Mixture proportions are determined solely by automatic adjustment of the pump control rod in accordance with variations in intake manifold pressure.

The mixture control, shown in Fig. 3, consists of a flexible leather diaphragm G connected to the end of the pump control rod H. The left side of the diaphragm is exposed to atmospheric pressure, and the right side is subject to intake manifold pressure by means of the connection A. Thus the net force acting on the diaphragm is the difference between intake and atmospheric pressure multiplied by the effective area of the diaphragm. This force is opposed by a group of three springs housed inside the diaphragm chamber and adjusted to make contact with the diaphragm throughout the travel of the pump control rod.

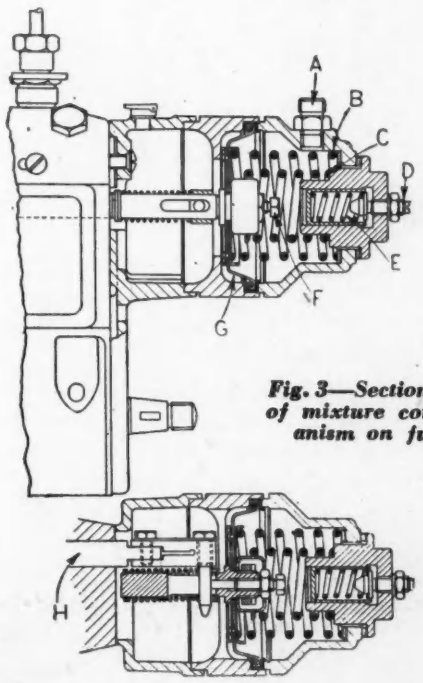


Fig. 3—Sectional drawings of mixture control mechanism on fuel pump

Specifications of Thornycroft Gasoline Injection Engine

Type	Six-cyl, overhead-valve gasoline engine with fuel injection.
Bore	4.125 in.
Stroke	6.0 in.
Displacement	481 cu in.
Compression ratio	6.92 to 1
Maximum power	150 bhp at 1900 rpm
Maximum torque	445 lb-ft at 800 rpm
Maximum bmep	140 psi at 800 rpm
Full load sp fuel consumption at 1900 rpm	0.56 lb per bhp per hr with bmep of 129 psi
Weight, with oil	1680 lb

Movement of the diaphragm toward the left for increasing fuel supply is limited by a circumferential ledge formed in the mounting plate casting. This full-left position for full load is possible only when the intake pressure is at a maximum. In this case, only the outer or full load spring B is in contact with the diaphragm. A slight decrease in intake pressure moves the diaphragm to the right, away from the stop, pulling the control rod with it and so reducing the quantity of fuel delivered. Further decrease in intake pressure causes additional movement to the right until contact is made with the center or cruising spring C. The total force acting on the diaphragm is then opposed by both springs B and C, so that the rate of decrease of fuel delivery for a given change of intake pressure is decreased. Finaly, as the intakepressure approaches that obtained at idling speeds, contact is made with the third spring E, which further increases the opposing spring force. This third or idling spring can be adjusted externally by means of a screw and lock-nut D.

The connection between the diaphragm unit and the pump control rod consists of a slotted link loaded by means of an overriding spring. This serves the dual purpose of allowing the maximum fuel setting to be adjusted by screw F and the mixture control rod to be manually over-ridden in order to obtain a very rich mixture to assist in cold starting. This over-riding device, housed in a small casting at the opposite end of the pump, consists of a small pin and roller carried on an extension of the control rod. A lever connected externally to the driver's cab makes contact with the roller so that the pump control rod can be pulled away from

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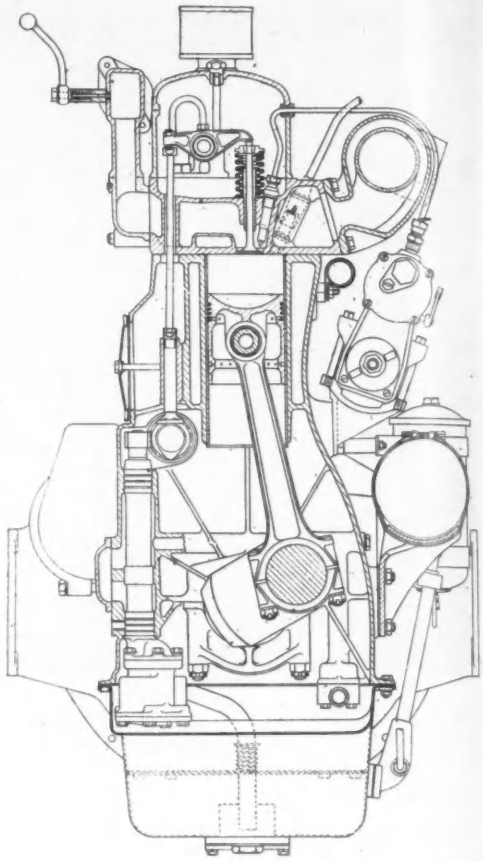


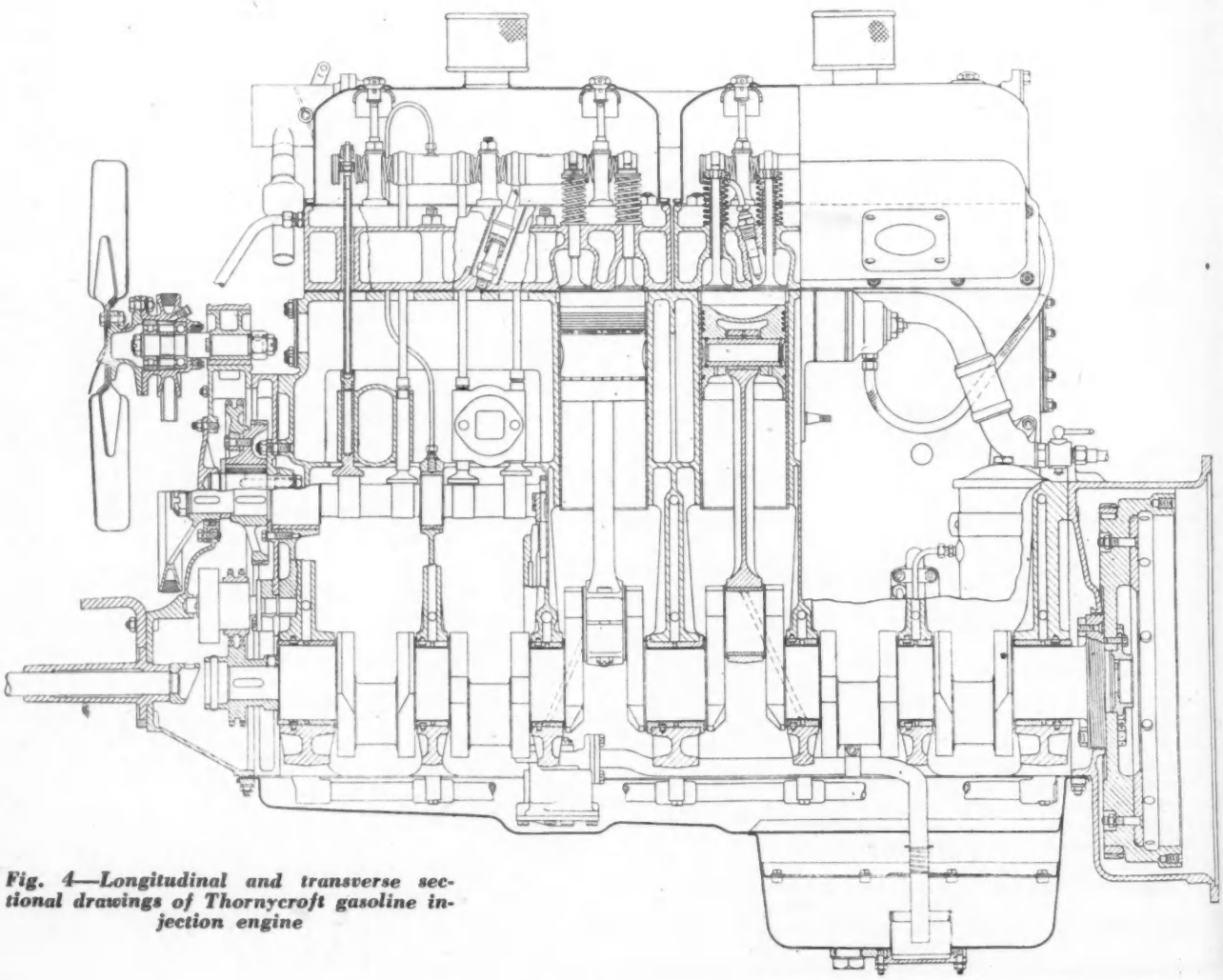
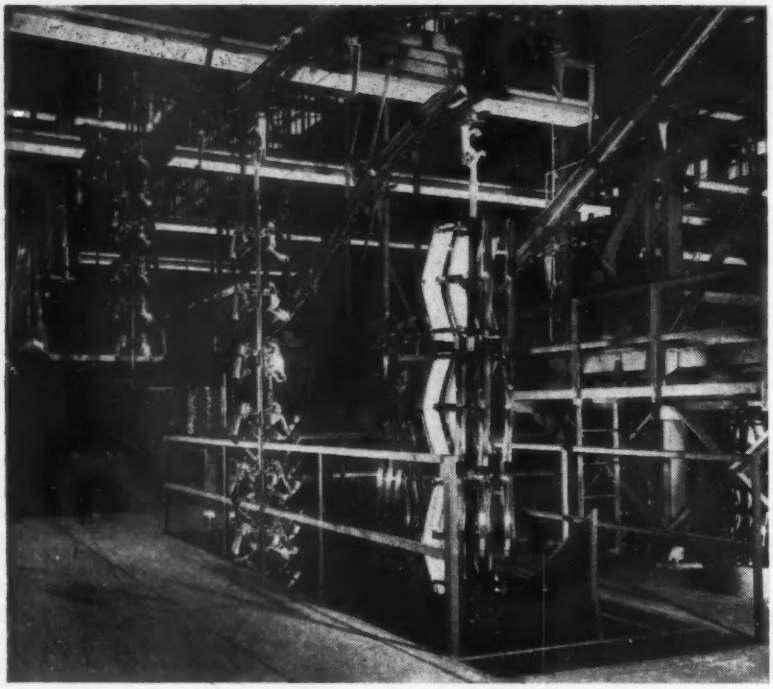


Fig. 4—Longitudinal and transverse sectional drawings of Thornycroft gasoline injection engine

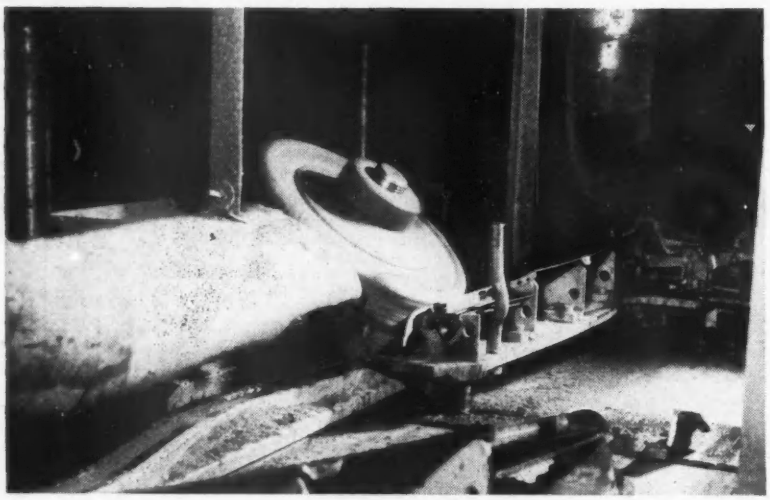
Current Passenger Car Price, Weight and Body Table

Following are two sets of car prices, at factory, as of the end of August, 1947. The list price which does not include federal taxes or handling charges is compared with the suggested delivered price at factory which includes federal taxes and handling charges where noted. All prices are for cars with standard equipment. State or local taxes, transportation and finance charges and optional equipment are extra.

BODY, MAKE AND MODEL	List Price at Factory without Federal Taxes	Federal Taxes and Handling Charges	Delivered Price at Factory including Federal Taxes	Shipping Weight
BUICK				
Series 40				
Sedanet, 2d.	$1497	$114	$1611	3670
Sedan, 4d.	1556	117	1673	3720
Series 50				
Sedanet, 2d.	1708	135	1843	3795
Sedan, 4d.	1790	139	1929	3910
Convertible Coupe, 2d.	2175	158	2333	4050
Estate Wagon	2622	183	2805	4170
Series 70				
Sedanet, 2d.	1968	163	2131	4095
Sedan, 4d.	2065	167	2232	4190
Convertible Coupe	2463	188	2651	4345
Estate Wagon	3030	219	3249	4445
CADILLAC				
Series 61				
Club Coupe, 2d.	2060	140	2200	4080
Touring Sedan, 4d.	2175	149	2324	4165
Series 62				
Club Coupe, 2d.	2290	156	2446	4145
Convertible Coupe, 2d.	2720	182	2902	4455
Touring Sedan, 4d.	2360	163	2523	4235
Series 60-Special				
Touring Sedan, 4d.	2990	205	3195	4370
Series 75				
Business Sedan, 9p.	4095	273	4368	4790
Touring Sedan, 4d.	4190	281	4471	4875
Business Imperial, 9p.	4275	285	4560	4800
Sedan, 4d., 7p.	4400	286	4686	4895
Imperial, 7p.	4590	297	4887	4930
CHEVROLET				
Stylemaster-EJ				
Business Coupe, 2d.	1080	80	1160	3050
Sport Coupe, 2d.	1120	82	1202	3060
Town Sedan, 2d.	1135	84	1219	3075
Sport Sedan, 4d.	1190	86	1276	3130
Fleetmaster-EK				
Sport Coupe	1195	86	1281	3090
Town Sedan, 2d.	1200	86	1286	3125
Sport Sedan, 4d.	1255	90	1345	3185
Cabriolet	1525	103	1628	3390
Station Wagon	1775	118	1893	3465
Fleetline-EK				
Aerosedan	1225	88	1313	3125
Sedan	1280	91	1371	3150
CHRYSLER				
Royal-Six				
Coupe, 2d., 3p.	1561	87	1648	3373
Sedan, 2d.	1626	90	1717	3458
Club Coupe, 2d.	1651	91	1742	3443
Sedan, 4d.	1661	92	1753	3523
Sedan, 8p.	2043	112	2155	3977
Limousine, 8p.	2163	119	2282	4022
Windsor-Six				
Coupe, 2d., 3p.	1611	89	1700	3383
Sedan, 2d.	1691	93	1784	3468
Club Coupe, 2d.	1701	94	1795	3448
Sedan, 4d.	1711	94	1805	3528
Sedan Traveler	1846	102	1948	3610
Convertible Coupe	1991	109	2100	3693
Sedan, 8p.	2093	115	2208	3977
Limousine, 8p.	2213	121	2334	4052
Saratoga-Eight				
Coupe, 2d., 3p.	1873	103	1976	3817
Sedan, 2d.	1948	106	2054	3900
Club Coupe, 2d.	1958	107	2065	3892
Sedan, 4d.	1973	108	2081	3972
New Yorker-Eight				
Coupe, 2d., 3p.	1973	108	2081	3837
Sedan, 2d.	2048	112	2160	3932
Sedan, 4d.	2073	113	2186	3987
Convertible Coupe	2323	126	2449	4132
Town & Country-8				
Sedan, 4d.	2496	136	2632	4300
Convertible Coupe	2873	155	3028	4332
Crown Imperial-8				
Sedan, 8p.	3905	207	4112	4810
Limousine, 8p.	4005	212	4217	4875
CROSLEY				
Sedan, 2d.	888	.....	.....	1115
Convertible	949	.....	.....	1110
DE SOTO				
DeLuxe				
Coupe, 2d., 3p.	1451	80	1531	3303
Sedan, 2d.	1516	84	1600	3398
Club Coupe	1541	85	1626	3393
Sedan, 4d.	1551	86	1637	3428
Custom				
Sedan, 2d.	1581	87	1668	3423
Club Coupe, 2d.	1591	88	1679	3378
Sedan, 4d.	1601	88	1689	3433
Convertible Coupe, 2d.	1891	104	1995	3618
Sedan, 8p.	1983	109	2092	3837
Limousine, 8p.	2103	115	2218	3995
Suburban	2283	125	2408	4012
DODGE				
DeLuxe				
Coupe, 2d., 3p.	$1347	$75	$1422	3146
Sedan, 2d.	1417	78	1495	3236
Sedan, 4d.	1457	81	1538	3256
Custom				
Club Coupe	1502	83	1585	3241
Sedan, 4d.	1507	83	1590	3281
Town Sedan	1577	87	1664	3331
Convertible Coupe	1812	99	1911	3461
Sedan, 8p.	1861	103	1964	3757
FORD				
DeLuxe Six				
Coupe, 2d.	1078	76	1154	3033
Tudor	1133	79	1212	3183
Fordor	1188	82	1270	3213
Super DeLuxe Six				
Coupe	1170	81	1251	3033
Tudor	1225	84	1309	3183
Sedan Coupe	1245	85	1330	3133
Fordor	1285	87	1372	3233
DeLuxe Eight				
Coupe	1150	80	1230	3066
Tudor	1205	83	1288	3216
Fordor	1260	86	1346	3246
Super DeLuxe-Eight				
Coupe	1245	85	1330	3066
Tudor	1295	87	1382	3216
Sedan Coupe	1320	89	1409	3166
Fordor	1350	90	1440	3266
Conv. Club Coupe	1635	105	1740	3266
Station Wagon	1855	117	1972	3520
Sportsman	2150	132	2282	3366
FRAZER				
Sedan, 4d.	2152	212	2364	3375
Manhattan Sedan	2550	286	2836	3375
HUDSON				
Super Six-171				
Coupe, 2d., 3p.	1516	112	1628	2975
Brougham, 2d.	1588	116	1704	3055
Coub Coupe	1626	118	1744	3040
Sedan, 4d.	1631	118	1749	3110
Convertible Brougham	1889	132	2021	3220
Commodore Six-172				
Club Coupe	1762	125	1887	3090
Sedan, 4d.	1770	126	1896	3175
Super Eight-173				
Club Coupe	1727	128	1855	3210
Sedan, 4d.	1733	129	1862	3260
Commodore Eight-174				
Club Coupe	1821	134	1955	3260
Sedan, 4d.	1837	135	1972	3330
Convertible Brougham	2050	146	2196	3435
KAISER				
Sedan, 4d.	1967	207	2174	3302
LINCOLN				
Club Coupe	2370	163	2533	3915
Sedan, 4d.	2390	164	2554	4015
Club Coupe, Custom	2530	171	2701	3915
Sedan, 4d., Custom	2550	172	2722	4015
Convertible Coupe	2950	193	3143	4245
Continental Coupe	4380	282	4662	4125
Continental Cabriolet	4460	286	4746	4135
MERCURY				
Sedan, 2d.	1490	102	1592	3268
Sedan Coupe	1540	105	1645	3218
Town Sedan, 4d.	1555	105	1660	3298
Club Convertible	1880	122	2002	3368
Station Wagon	2075	132	2207	3571
NASH				
600 Series				
Brougham, 2d.	1316	99	1415	2731
Slip. Sedan, 4d.	1321	99	1420	2826
Trunk Sedan, 4d.	1365	99	1464	2786
Ambassador				
Brougham, 2d.	1632	119	1751	3312
Slip. Sedan, 4d.	1648	119	1767	3412
Trunk Sedan, 4d.	1690	119	1809	3387
Suburban Sedan, 4d.	2086	141	2227	3522
OLDSMOBILE				
Series 66-Six				
Club Coupe	1385	103	1488	3316
Club Sedan, 2d.	1410	103	1513	3323
Sedan, 4d.	1450	106	1556	3356
Convertible Coupe	1725	120	1845	3611
Station Wagon	2305	151	2456	3770
Series 76-Six				
Std. Club Sedan, 2d.	1475	109	1584	3495
Std. Sedan, 4d.	1545	114	1659	3523
DeLuxe Club Sedan, 2d.	1590	115	1705	3515
DeLuxe Sedan, 4d.	1655	118	1773	3590
Series 68-Eight				
Club Coupe	1440	106	1546	3446
Club Sedan, 2d.	1465	107	1572	3453
Sedan, 4d.	1505	109	1614	3486
OLDSMOBILE (Continued)				
Convertible Coupe	$1780	$123	$1903	3741
Station Wagon	2360	154	2514	3900
Series 78-Eight				
Std. Club Sedan, 2d.	1530	113	1643	3612
Std. Sedan, 4d.	1600	117	1717	3638
DeLuxe Club Sedan, 2d.	1645	117	1762	3650
DeLuxe Sedan, 4d.	1710	120	1830	3705
Series 98-Eight				
Club Sedan, 2d.	1740	125	1865	3714
Sedan, 4d.	1790	127	1917	3793
Convertible Coupe	2160	147	2307	4049
PACKARD				
Clipper Six-2100				
Club Sedan, 2d.	1796	116	1912	3475
Touring Sedan, 4d.	1820	117	1937	3520
DeLuxe Clipper-2111				
Club Sedan, 2d.	1987	137	2124	3650
Touring Sedan, 4d.	2011	138	2149	3695
Super Clipper-2103				
Club Sedan, 2d.	2575	172	2747	3980
Touring Sedan, 4d.	2599	173	2772	4025
Cus. Sup. Clipper-2106				
Club Sedan, 2d.	3184	200	3384	4030
Touring Sedan, 4d.	3246	203	3449	4090
Sedan, 4d.	4251	253	4504	4890
Limousine, 4d.	4407	261	4668	4920
Super Eight-2232				
Convertible Victoria, 2d.	2990	185	3175	4110
Custom Eight-2233				
Convertible Victoria, 2d.	3860	235	4095	4380
PLYMOUTH				
DeLuxe				
Coupe, 3p.	1139	66	1205	2977
Sedan, 2d.	1164	68	1232	3047
Club Coupe	1189	69	1258	3037
Sedan, 4d.	1214	70	1284	3082
Special DeLuxe				
Coupe, 3p.	1209	69	1278	2982
Sedan, 2d.	1239	71	1310	3062
Club Coupe	1264	72	1336	3057
Sedan, 4d.	1289	74	1363	3107
Convertible Coupe	1565	89	1654	3282
Suburban	1669	94	1763	3402
PONTIAC				
Torpedo Six				
Business Coupe	1287	100	1387	.....
Sport Coupe	1338	102	1438	3300
Sedan, 2d.	1350	103	1453	3305
Sedan Coupe	1380	104	1484	3305
Sedan, 4d.	1406	106	1512	3330
Conv. Sedan Coupe	1690	121	1811	3570
Conv. Sedan Coupe, DeLuxe	1730	123	1853	.....
Streamliner Six				
Sedan Coupe	1439	108	1547	3405
Sedan, 4d.	1487	111	1598	3460
Station Wagon, Std.	2092	143	2235	.....
Station Wagon, DeL.	2166	146	2312	3725
Torpedo Eight				
Business Coupe	1332	102	1434	.....
Sport Coupe	1381	104	1485	3365
Sedan, 2d.	1395	105	1500	3375
Sedan Coupe	1425	106	1531	3375
Sedan, 4d.	1451	108	1559	3415
Conv. Sedan Coupe	1735	123	1858	3645
Conv. Sedan Coupe, DeL.	1775	125	1900	.....
Streamliner Eight				
Sedan Coupe	1484	111	1595	3460
Sedan, 4d.	1532	113	1645	3520
Station Wagon, Std.	2137	145	2282	.....
Station Wagon, DeLuxe	2211	148	2359	3795
STUDEBAKER				
Champion DeLuxe				
Coupe, 3p.	1282	96	1378	2600
Sedan, 2d.	1347	99	1446	2685
Coupe, 5p.	1372	100	1472	2670
Sedan, 4d.	1377	101	1478	2735
Champ. Regal DeLuxe				
Coupe, 3p.	1352	99	1451	2620
Sedan, 2d.	1417	103	1520	2710
Coupe, 5p.	1442	104	1546	2690
Sedan, 4d.	1447	104	1551	2760
Convertible Sedan	1780	122	1902	2875
Commander-DeLuxe				
Coupe, 3p.	1547	114	1661	3140
Sedan, 2d.	1612	117	1729	3230
Coupe, 5p.	1637	118	1755	3210
Sedan, 4d.	1642	119	1761	3265
Comm. Regal DeLuxe				
Coupe, 3p.	1662	120	1782	3155
Sedan, 2d.	1727	123	1850	3245
Coupe, 5p.	1752	124	1876	3225
Sedan, 4d.	1757	125	1882	3280
Land Cruiser	1910	133	2043	3340
Convertible	2093	143	2236	3420
WILLYS				
Station Wagon	1495	.....	.....	.....



End of line in the new plating department. Bumper guards, grille blades, and silver streaks are seen leaving the last operation and ready for assembly.



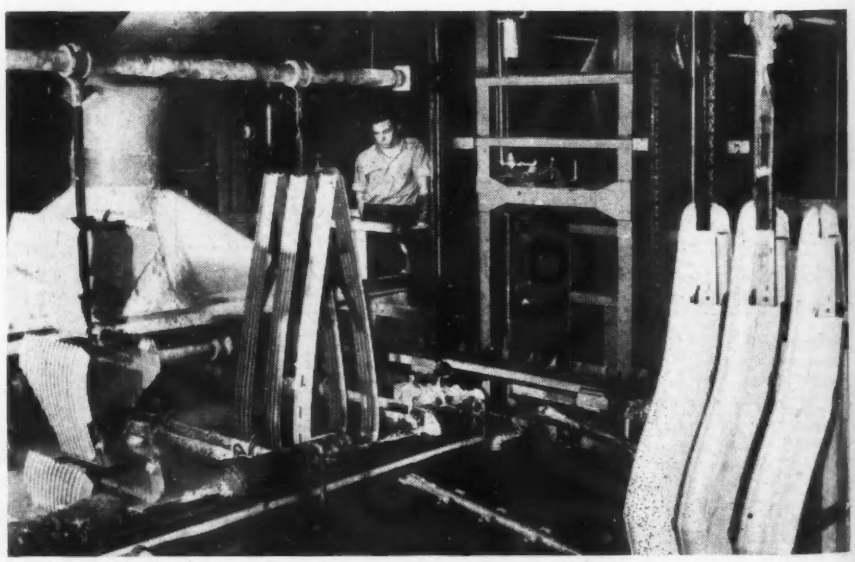
Pontiac's

IN THE rearrangement and expansion of its facilities the Pontiac Motor Div., General Motors Corp., has placed in operation what is considered to be one of the largest fully automatic chromium plating plants in this country. The set-up was designed for plating exterior automobile parts such as grille bars, decorative moldings, and bumper guards. In addition Pontiac also has increased the capacity of its foundry, including the installation of two large cupolas, and has placed in operation a new parts warehouse. Both of these improvements will be described in the latter part of this article.

Built for easy access to the press shop and final assembly so as to reduce materials handling into and out of the department, the plating plant occupies an area of 50 ft by 660 ft or 33,000 sq ft. The plating machine is composed of three sections: the copper section with copper strike and copper plate; nickel bath; and chromium plating tanks. Each section covers an area of about 22,500 sq ft.

In operation, parts brought in from the press shop first go to the automatic polishing and buffing machine—a fully conveyorized unit—for initial polishing. As the parts are removed from this conveyor they go through hand polishing

(Above) Close-up of one of the automatic polishing heads on the machine in the plating department.



(Right) This view taken from the catwalk around the plating machine shows parts on the conveyor as they are transported in and out of the various tanks.

Expanded Facilities

Major Improvements Include One of the Largest Fully Automatic Chromium Plating Plants, New and Enlarged Cupolas to Increase Foundry Pouring Capacity 50 Per Cent, and a Huge Parts Warehouse

By Joseph Geschelin

machines for final touches. The parts then are suspended on the main conveyor line of the plating machine, entering first the power wash, then proceeding through the series of cleaning and rinsing tanks, copper strike and copper plate.

After copper plating the work is polished and buffed on another automatic machine before entering the chromium plating section, to assure a high finish. To facilitate such transfers from the conveyor lines, each section has its own automatic rack loading conveyor. Unloading of racks from the plating machine as well as the transfer of racks from the feeder conveyor to the plating machine is done automatically.

The first section of the plating machine—copper plating—is 207 ft long, has 15 automatic tank stations, and requires 52 minutes to complete the cycle. The main copper plating tank contains 58,000 gal of plating solution which is circulated continuously and filtered at the rate of 1260 gpm. The circulating system passes through 16 heat exchangers to maintain a constant temperature level.

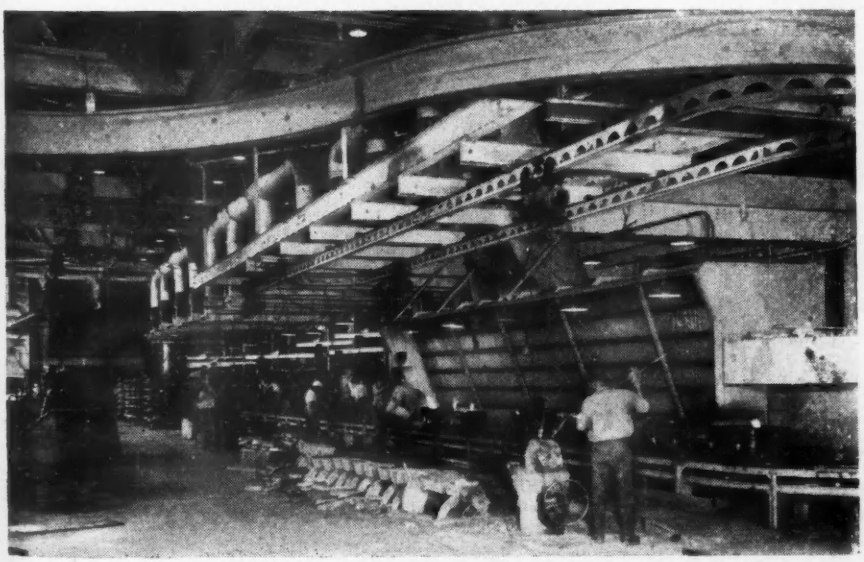
The second section—nickel plating—is 250 ft long, has 14 tank stations, requires 64 minutes for completion of the cycle. The nickel plating tank contains 67,200 gal of solution which is filtered constantly and heated to the required temperature by passage through a series of 15 heat exchangers. In addition, part of the solution goes through an electrolytic purifying tank connected to a 2000 amp, 6-volt, rectifier.

The ten-station chromium plating section is 139 ft long, has a main tank with a capacity of 15,700 gal, which is divided into two compartments. This permits two separate lanes for the work, each of which may be operated at different current densities.

Demineralizers of the de-ionizing type for softening the city water and removing iron content have a capacity of 3000 gal per hr, supply water to the plating tanks and rinse tanks.

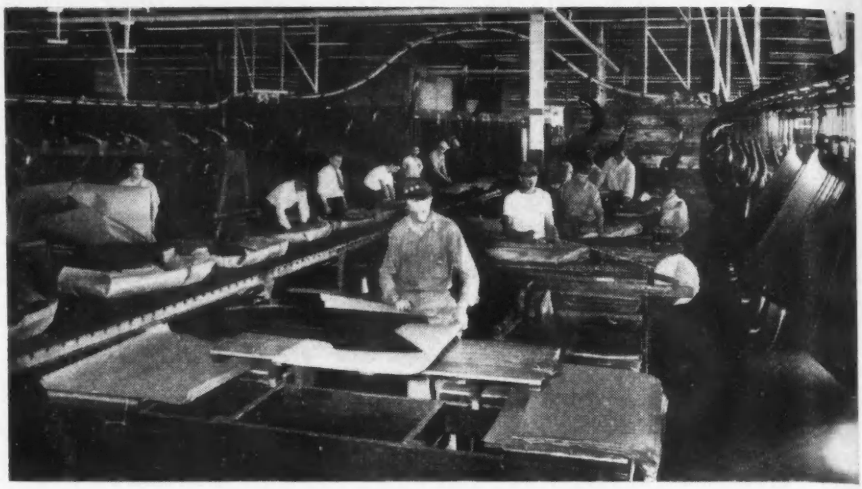
No safety feature was overlooked when assembling and installing the machine. A catwalk is provided along the length of each unit for men to check the operation and service the machine as necessary. Along this walk is a switch cord which may be pulled at any point, stopping the entire machine. Switches located at several other points may be used for the same purpose. A master panel at the starting end of the machine indicates at which point the machine has been stopped. Only at this master board may the machine be started, and then not until the trouble light is off and a warning horn sounded for at least 30 sec.

Direct current is supplied by 22 generators, ranging in capacity from 5000 to 15,000 amp. The total electrical capacity of the system is 285,000 amp, which could furnish electric power to



One of Pontiac's new self-contained foundry pouring lines for small parts. At the far left of this line are molding machines fed by the new sand distributing system, said to be an important improvement in foundry practice.

7000 homes. The ventilating system consists of 32 blower type fans using motors from 1.5 to 20 hp. The ventilating stacks vary from one to five feet in diameter.



This picture shows fenders being carried into the new parts warehouse by overhead conveyor lines. After these fenders are wrapped they are placed on a belt conveyor that transports them directly to loading docks for shipment.

Foundry Improvements

The progressive increase in Pontiac's foundry capacity that has been going on for some time is rapidly nearing completion. Commissioning of the two new 108-in. coupolas, said to be the largest in the automotive industry, is one of the major steps in this direction. As these cupolas get into regular pouring schedule the four present units will be torn down and enlarged to 102 in., permitting an ultimate increase in melting capacity of 50 per cent, up to about 1200 tons per day.

Apart from increasing melting capacity the large cupolas offer two major advantages of vital interest. First is the ability to use a double ceramic lining, thus increasing service life with reduced down-time periods. Of equal importance is the adoption of a new principle in cupola management—an overhead system of baffling and water spray designed to cool the exhaust gases and virtually eliminate the discharge of cinders. The latter has been a particularly troublesome problem heretofore because of the proximity of the foundry to the machine shops. Now the management is assured that the plant as well as the surrounding residential area will be free from the tons of cinders usually disgorged by any large foundry.

Another aspect of foundry modernization is the recent installation of a large sand reclamation system of advanced type, designed to store, reclaim, and reuse molding sand and core sand; and to screen and dry new sand. The storage pits hold 21,000 tons of sand. From a management standpoint the economic value of the sand handling system lies in a drastic reduction in new sand purchases and its traffic of freight cars, reduction in storage facilities, and an answer to the problem of waste sand disposal.

Ordinary molding sand is readily reworked with little more than screening and treatment with oils and bonding agents. Facing and core sands, however, require considerably more handling. These sands are first scrubbed to remove the coating of foreign materials, then they go to a water classifier where the fines are floated off. The wet sand goes to a centrifuge for removal of excess water and is then dried. Operation of the reclamation system is completely mechanized and practically automatic.

Core making has been modernized and mechanized and is undergoing some radical changes in procedure. Perhaps the most outstanding is the introduction of small self-contained lines for blowing large cores such as the ones for cylinder blocks. These have a continuous merry-go-round conveyor on which the molds are built up by operators, the core being properly filled by blowing under the machine head, which is an automatic operation. This procedure eliminates the former method of making large cores on a sand slinger.

At the same time major changes are being made in the molding department. These consist in the progressive installation of a series of self-contained molding and pouring lines for groups of individual parts produced in the foundry. The objective is to create a family of self-contained molding and pouring units capable of specialization and consequent facility and cost reduction. Apart from the economy of the new set-up, an important consideration is that of improving worker comfort. It is expected that the program will result in better control of fumes and dirt by localizing the operations, this being further enhanced by a new system of exhaust hoods and overhead dust collectors throughout the foundry. Several of the new lines already are in operation while others are under construction and will be readied for operation as quickly as time permits.

A new sand unloader, of automatic belt type, is another of the advanced features that has attracted considerable attention. It is said to promise better casting quality, reduce rejects and spoiled work, and increase productivity. The primary purpose of the unloading belt is to insure a constant supply of free-flowing sand for each molding machine. It eliminates the packing and caking of sand, formerly one of the worst bugaboos in the foundry. When using the old type storage hopper it was frequently necessary to pound on the side with a hammer to loosen the caked sand. The sand falling into the molding flask would often be lumpy and the result unsatisfactory.

The unloader has made it possible to use a sand hopper of a different and much improved design. The new hopper carries only slightly more than enough sand for each mold, thus eliminating the packing and caking common to the old type which necessarily held so large an amount that its weight forced it to pack.

(*Turn to page* 76, *please*)

French Government Extends Financial Aid to Racing Team

Racers Are Equipped with 91.5 Cu In. V-8 Engine Having Unusual Design Features, Lightweight Chassis, Front and Rear Torsion Bar Suspension

By W. F. Bradley
Special European
Correspondent for AUTOMOTIVE INDUSTRIES

DESIGNED by Engineer A. Lory, the man who produced the most successful Delage racing cars, the French Government's new 91.5 cu in. racing machines are an attempt to capture international laurels. The body behind the production is the Centre d'Etudes Techniques, a semi-official organization for the benefit of the French motor industry, and it has facilities at the State aeronautical arsenal, the automobile laboratory and Montlhery race track.

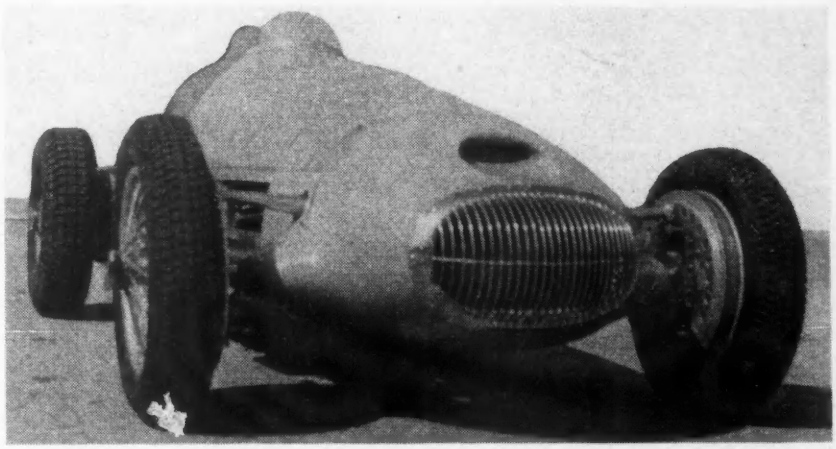
First of the new racers is complete and will be tried out in the French Grand Prix race in September at Lyons. The second car is being built and in 1948 a complete team will be in the field under the general title—France. This is the first time the French Government has given financial backing to any racing organization.

After building straight sixes and eights and V-12s, Lory has decided on V-eight construction for his 91.5 cu in. models, with a bore and stroke of 2.36 in. by 2.58 in. The two cylinder blocks have integral heads and are staggered longitudinally to allow side by side mounting of the very short I-section rods, with roller bearings. Roller bearings are also used for the crankshaft. There are four overhead camshafts, two valves and two plugs per cylinder, all the spur pinion timing gear being at the rear, and the two magnetos being high up and at the back of the engine. Compression ratio is 7 to 1 and engine speed 7000 to 8000 rpm. Borgo light alloy pistons are used, with a bronze bushing for the piston pin. Rods are 2-bolt type. Lubrication is by three pumps—one for the crankshaft, one for the accessories, and one for scavenging.

There is a separate Roots blower for each block of cylinders, these being mounted at the front of the engine and running at 0.75 engine speed. The carburetor is a dual Solex with four float chambers, fed from an Aivaz pump, drawing from five gasoline tanks. The main tank is at the rear while four others are placed laterally to assure the best weight distribution.

There is a water pump for each block of cylinders, the water being deilvered direct to the exhaust valve seats and returned to two forward radiators, with the oil radiator mounted between the pair. With the carburetor and intake

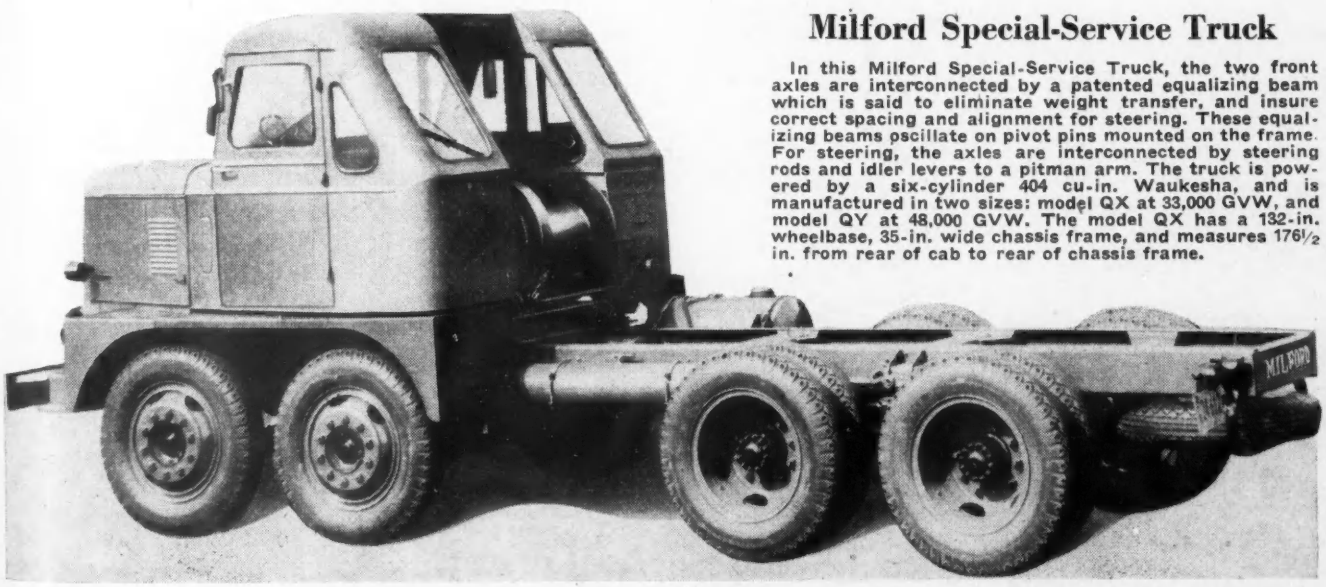
(*Turn to page 67, please*)



This French national racing car, designed by a former Delage engineer, was built from funds provided by the French automobile industry.

Milford Special-Service Truck

In this Milford Special-Service Truck, the two front axles are interconnected by a patented equalizing beam which is said to eliminate weight transfer, and insure correct spacing and alignment for steering. These equalizing beams oscillate on pivot pins mounted on the frame. For steering, the axles are interconnected by steering rods and idler levers to a pitman arm. The truck is powered by a six-cylinder 404 cu-in. Waukesha, and is manufactured in two sizes: model QX at 33,000 GVW, and model QY at 48,000 GVW. The model QX has a 132-in. wheelbase, 35-in. wide chassis frame, and measures 176½ in. from rear of cab to rear of chassis frame.



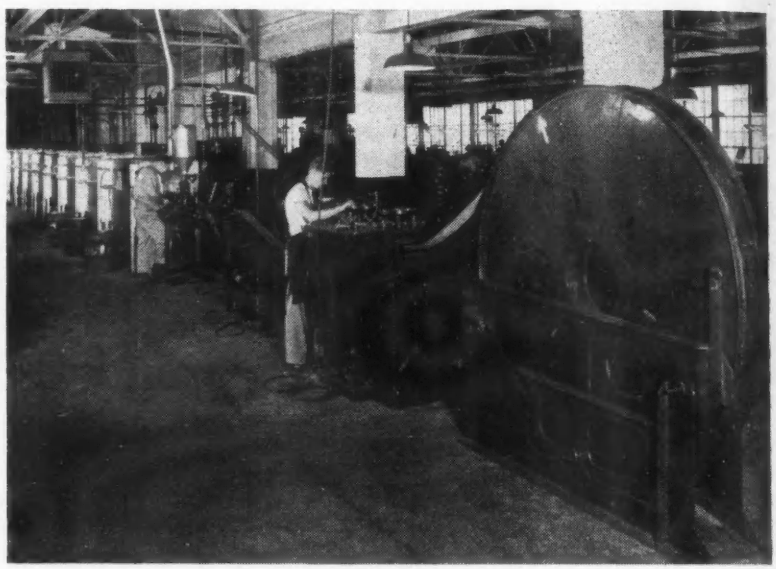
Precision Powder Spreader

and Other Highlights of Bearing Strip Process

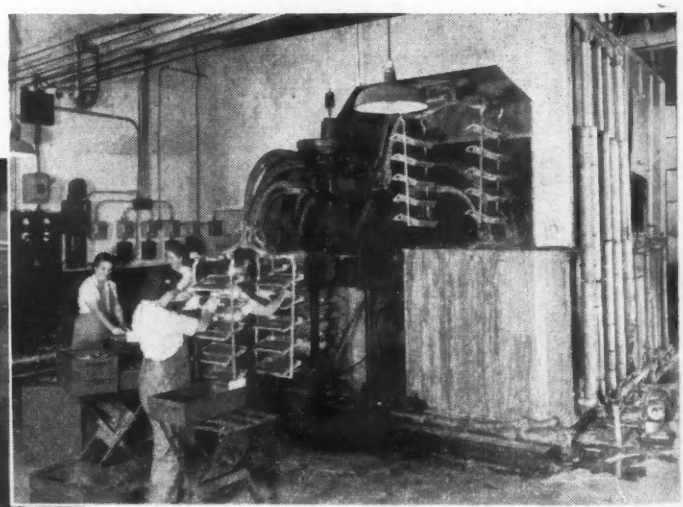
THE Federal-Mogul Corp. has placed in operation four continuous strip mills at Greenville, Mich., for producing the H-24 copper-lead sintered metal powder bearing which it announced early this year. At the present time the plant is making two distinct types of the steel-back bearings: a double-face strip, and a single-coated strip. In each instance the bearing is subjected to two separate sintering operations with an intermediate rolling to eliminate porosity, and then given a lead-tin coating with a flash tin-plate over the lead-tin coating.

Production of the H-24 is actually a continuous process. Steel strip of the desired width and thickness, either tin or copper plated to prevent rusting in storage, is fed from a large reel through a set of straightening rolls and enters the station at which the loose powder is applied. At this point Federal Mogul has developed a unique device, capable of quick and accurate adjustment, for spreading the powder over the strip so as to produce a parallel top surface and uniformity of layer thickness to a toler-

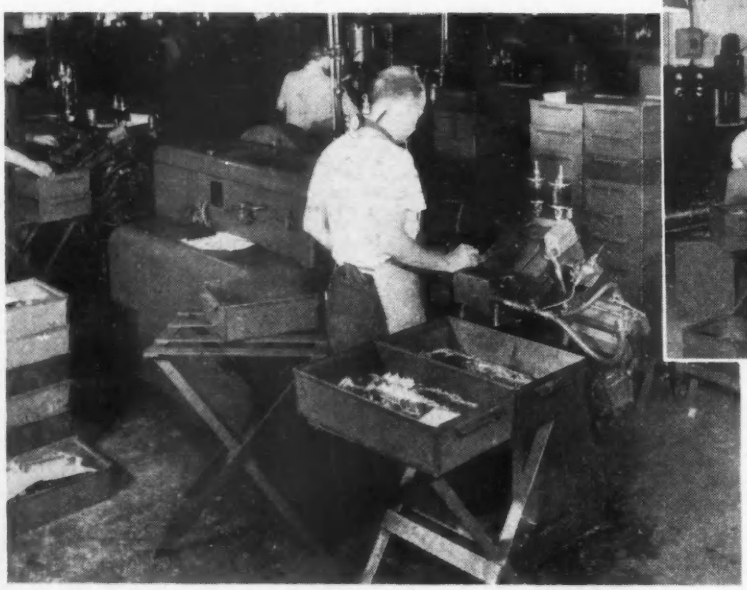
(*Turn to page 78, please*)



One of Federal-Mogul's strip mills for continuous production of the H-24 steel-back sintered copper-lead powder bearing. The metal powder is applied to the strip at the station at the left where the second operator can be seen. The General Electric sintering furnace is immediately behind this powder spreader, in the background.



(Above) Semi-automatic tin-plating machine built by Frederic B. Stevens, Inc.



(Left) Typical of the special horizontal machines developed by Federal-Mogul is this unit for broaching the height of half shells.

New Auxiliary Transmissions

Announced by Fuller

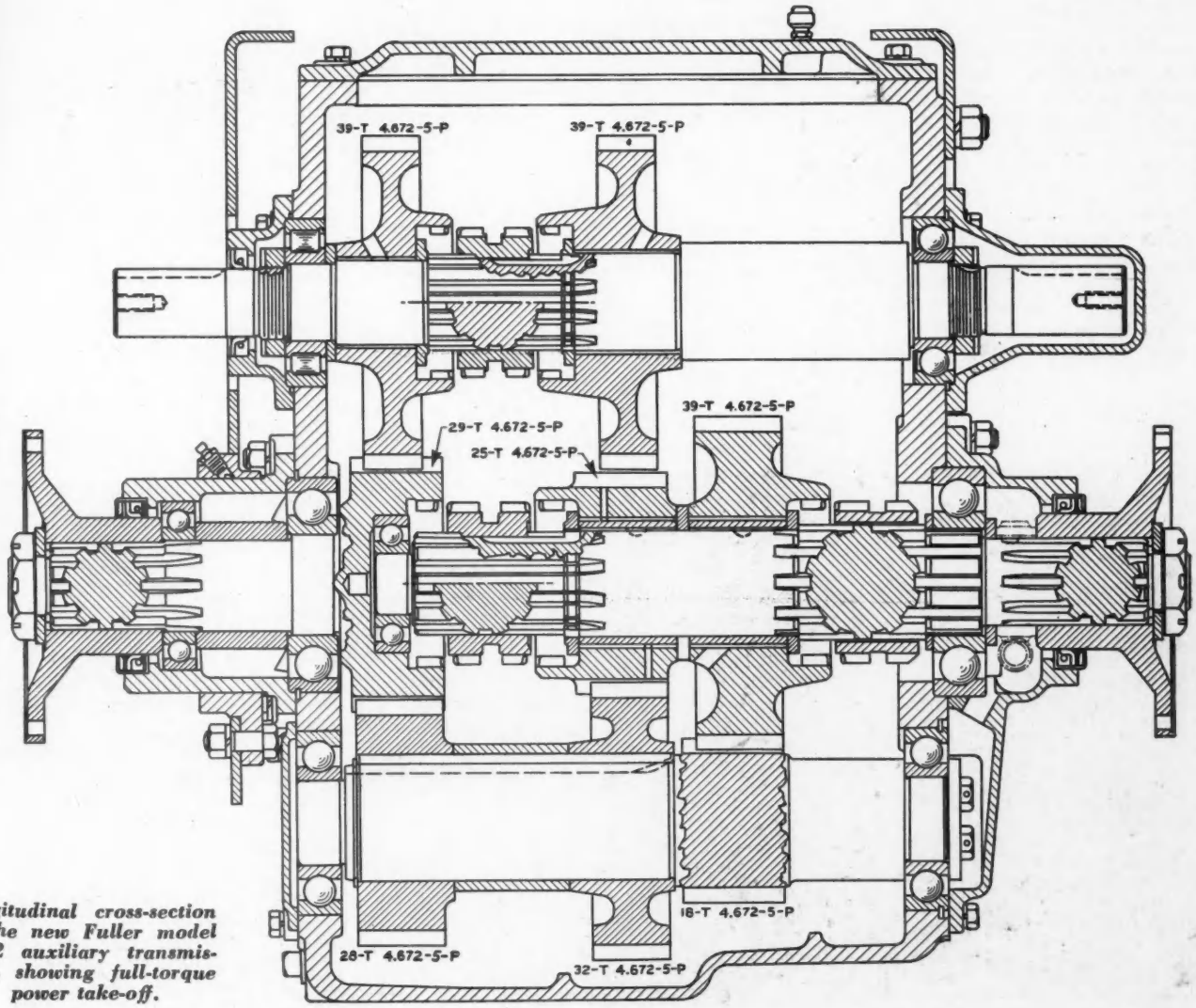
Two new auxiliary transmissions of three speed overdrive type have been announced by the Fuller Manufacturing Co., Kalamazoo, Mich. The first of these is the model 3T92 which is similar in basic design to the Fuller 3A92 auxiliary, but features a novel full-torque power take-off drive with forward and reverse rotation. This unit is intended for use in combination with heavy-duty four or five-speed primary transmissions. The second unit is the model 3B92, a companion model to the familiar 3A92 auxiliary. It has the conventional power take-off arrangement, and provides the following gear ratios: 0.836 to 1 overdrive, 1.00 to 1 direct, and 1.235 to 1 reduction.

The model 3T92, shown in the accompanying drawing, offers the following ratios: 0.754 to 1 overdrive, 1.00 to 1 direct, and a reduction of 2.09 to 1. The power take-off has two ratios depending upon direction of rotation, the actual reduction with respect to engine speed being determined by the gear ratio of the primary transmissions. In the auxiliary the take-off has a ratio of 1.175 to 1 with same rotation as the input shaft, and 1.345 to 1 in reverse rotation.

As illustrated, the feature of the full-torque take-off on the 3T92 is that the drive is taken directly off the end of the input shaft. Consequently, the drive is from the main case, and does not depend upon fastenings to hold the main box and take-off together. The new arrangement makes the drive an integral part of the transmission with the same rigidity and strength.

Gearing and shafts for the 3T92 auxiliary are the same as those in the 3A92. Both input and out-put shafts are 2¼ in. in diameter with a 10-spline end. Either the No. 7520 or No. 7521 universal joint flanges will be furnished on the 3T92. The out-put shaft is machined for flanges or sprockets, etc., furnished by the customer, and bored to 1¾ in. ID and for use with a 3/16 by ⅜ in. straight key.

Both the front and rear end of the 3T92 are designed for cross-member supports. Shifting is handled by two shift bars, the model AC control being designed to shift them. Power take-off is controlled by a single shift bar which can be operated by a single shift lever. Provision is made in the rear bearing cover for installation of speedometer gears. Oil capacity is 12 qt. Other details are shown in the drawing below.



Longitudinal cross-section of the new Fuller model 3T92 auxiliary transmission, showing full-torque power take-off.

NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58.

E-165—Profile Grinding Machine

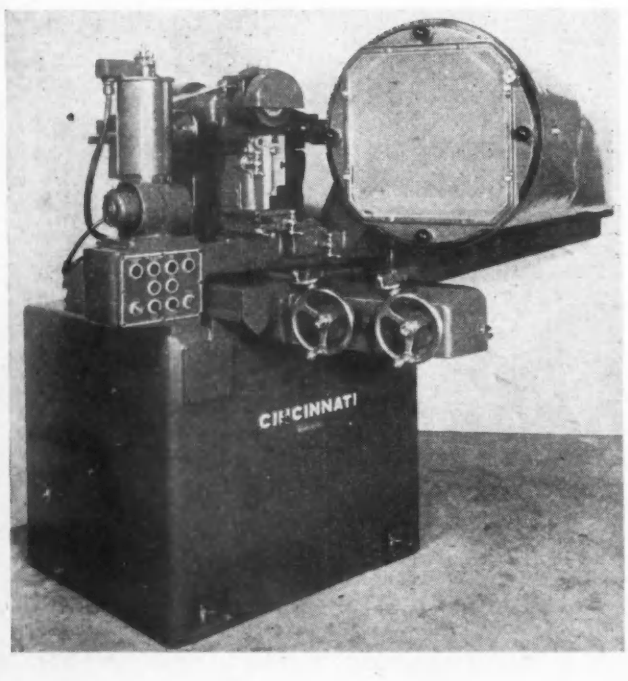
The Cincinnati Milling Machine Co., Cincinnati, Ohio, announces a new machine, the Projecto-Form grinding machine, for the grinding of extremely accurate small profile shapes. The Projecto-Form provides an optically enlarged image of the work, which may be compared as grinding progresses, with a previously prepared, enlarged scale master drawing. In effect, the machine combines the dual purposes of profile grinding machine and optical comparator.

A set of condenser lenses focuses a brilliant flood of parallel rays of light across the top surface of the workpiece. On the opposite side of the workpiece, and having the workpiece in its plane of focus, is an extremely precise optical projection lense system, which throws a greatly magnified silhouette image of the work profile on a ground glass viewing screen. The screen image corresponds exactly to the work profile as viewed from the operating position, without inversion or transposition. A magnification of 20 to 1 is supplied as standard equipment, and a 40 to 1 ratio is available at extra cost.

The "master" drawing, an enlarged. true scale duplicate of the desired work profile, is mounted behind, and in contact with, the ground glass viewing screen to permit comparison with the projected image. The projection unit is completely enclosed in a light-tight hood to maintain a brilliant screen image without dilution by the normal room lighting.

The workpiece may be positioned in relation to the optical system by means of longitudinal, transverse, and vertical slides, and a swivel movement of the work platen provides for angular adjustments of the work. These movements provide the means for accurately locating the projected image in relation to the "master drawing," and are accomplished by means of hand positioning ballcranks. Micrometer dials are not supplied for these adjustments since positioning of the work is accomplished by visual observation of its projected image. A precision measuring attachment is available for jobs which require accurate adjustments of the transverse and vertical work support slides.

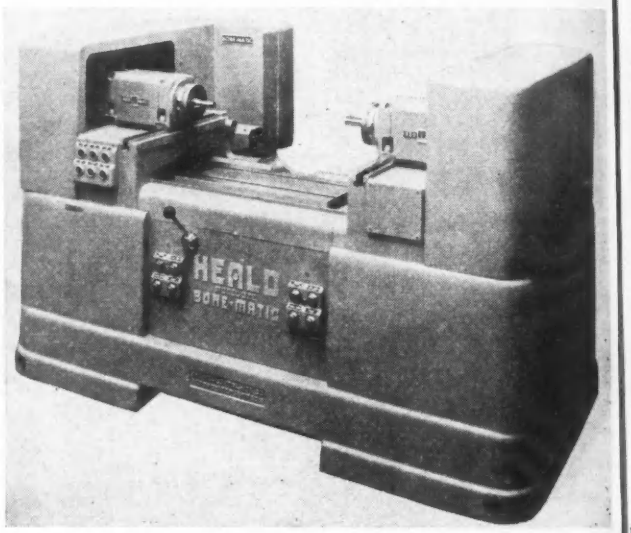
For jobs requiring the grinding of circular form tools, or other formed circular parts, a power driven circular grinding attachment is available. This attachment mounts on the face of the work holding platen and the workpiece is held between centers on a short arbor.



Projecto-Form grinding machine

E-166—New Line of Heald Bore-Matics

A new line of Bore-Matics has just been brought out by the Heald Machine Co., Worcester 6, Mass. These new machines, including a Tri-way, have capacities to handle very small or very large work. They are used for turning, facing, milling and chamfering, as well as finish boring. Parts may be roughed and precision finished at the same setting with an obvious saving of time, especially when several spindles are used.



Heald Bore-Matic

An improved hydraulic system circulates only the amount of oil needed, keeping it at an exceptionally low temperature. The oil is not in contact with the base, which further reduces distortion.

All new Bore-Matics are equipped for two-way boring with different feeds in the two directions, if desired. They have been designed low for convenient loading.

The temperature of the heads has been reduced about 50 per cent which increases the accuracy of the machines.

Other major features in the New Bore-Matic line are: No swinging latches are used, therefore there is no danger of a latch hanging up and allowing the table to run by and cause an accident; V-belt life has been increased many times by the use of large idlers; all tools are the same hand; reverse

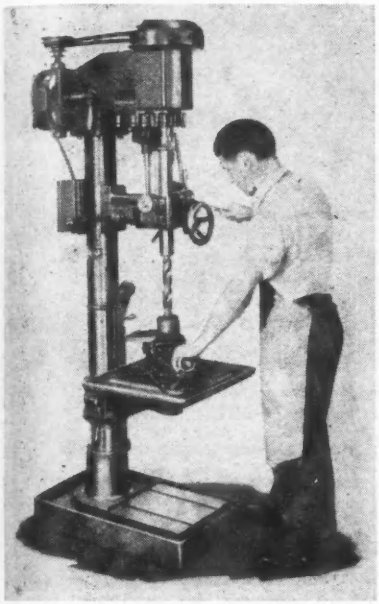
New Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58.

dog and positive stop are adjusted as one; the table traverse is exceptionally fast and accelerates while the table is traversing; and a hand control releases the brake when adjusting tools.

E-167—High Speed Drilling Machine

An entirely new high speed drilling and tapping machine is announced by the Sibley Machine & Foundry Corp., South Bend, Ind. The new 20-in. swing Sibley is an all-purpose machine. It is designed as a precision tool for sensitive drilling and tapping operations at high speed, and its sturdy construction and 2 hp motor are said to permit drilling in 1½ in. mild steel.



Sibley C-20 drilling machine

Controls are arranged to cut operator time. Selection of geared power feeds is made by turning a knob. Speeds are changed quickly by a positive release lever. The eight spindle speeds available are: In back gear—65, 95, 150, and 225 rpm; in direct drive—400, 575, 900, and 1360 rpm. Feeds are 0.003 in., 0.006 in., and 0.010 in.

Accuracy and speed are obtained in the new drive mechanism with a double ball bearing spindle assembly, with the spindle precision ground. Exact alignment of the table arm with the spindle is assured by boring the table arm after assembly with spindle of the machine. A rectangular oil groove table is furnished as standard equipment.

E-168—Lathe with Electronic Controls

The new Speedi-Matic, high-production, hand-screw machine offered by the Monarch Machine Tool Co., Sidney, O., is equipped with an automatic electronic system for selecting and controlling speeds and feeds. This makes it possible to set up as many as nine different speeds and six different feeds for each job, depending on the requirements of the successive operations.

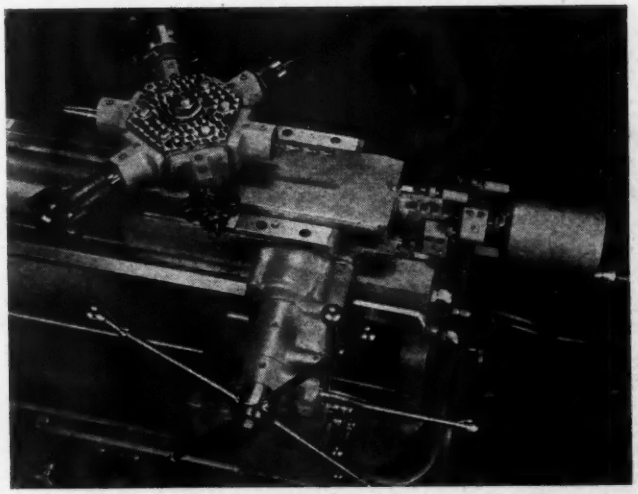
The new machine with its stepless range of spindle speeds—both forward and reverse—from 50 to 5000 rpm, is designed to handle small turning work in quantities of from 25 to 500 or more pieces with ease and quickness of setup.

The power feed ram-type turret with which the Speedi-Matic is equipped permits the correct feed to be repeated for every piece in the lot. Each tool is presented to the work manually, power feed is applied to the turret slide, and at the conclusion of the cut the tool is withdrawn manually. This keeps tool traverse time down to the absolute minimum. The electronically-controlled feed motor eliminates the need of a gearbox and makes available an infinite number of feeds within the entire range of ⅛ to 16 ipm.

The six-way precision turret will readily accept tools for any turret lathe operation required. It will index to six stations within 0.0002 in. or 1 in., out 2 in. from the face of the turret, thereby assuring repetitive accuracy on close tolerance work.

Inasmuch as the Speedi-Matic has such a wide range of spindle speeds, it is equally adaptable for chucking operations on work larger than the ⅞ in. maximum round stock capacity of the collet attachment. A standard three-jaw universal chuck or a variety of standard and special fixtures may be attached for second operation work.

The new Speedi-Matic is also available without the feed pre-selection feature in which case feeds from .0005 in. per revolution to .016 in. per revolution are provided through a conventional gearbox. Power feed may be omitted.



Monarch Speedi-Matic hand-screw machine

E-169—Small Flexarc Welders

A new and smaller designed Flexarc industrial line of a-c welders is available from Westinghouse Electric Corp., Pittsburgh 30, Pa. A compact, streamlined case and a well arranged interior with reactor and transformer built around high permeability Hipersil steel cores are features of the new line.

Called "The 65 Line" for the open circuit voltage, these new welders are said to incorporate the latest engineering features to provide high arc stability in the lowest as well as the highest current ranges of the five output ratings—200, 300, 400, 500 and a duplex 300/600 amp.

Built-in low voltage control assures high operating efficiency in the low current range; built-in capacitors assure a high power factor and economical full rated operation. Other features are natural ventilation and a movable core reactor operated by a single ball crank current adjusting mechanism. To reduce overall size and maintain uniformly high operating efficiency, fan cooling is employed in the 500 amp ratings.

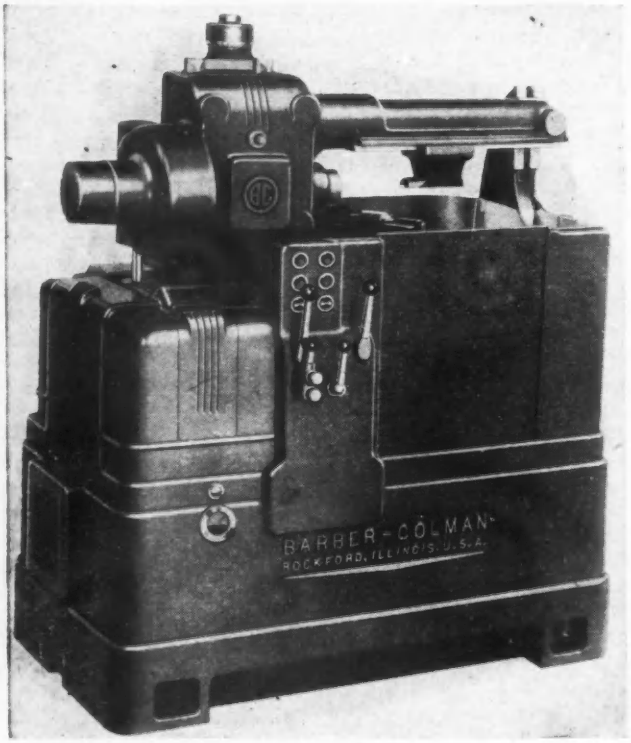
E-170—Hobbing Machine

The new Barber-Colman No. 8-12 production hobbing machine, made by the Barber-Colman Co., Rockford, Ill., features semi-automatic cycling, speed for carbide hobbing, conventional and climb hobbing in either direction, rapid traverse in either direction, and overall design to facilitate easy operating, servicing and maintenance. It is constructed in unit assemblies, with hardened and ground Vee and flat ways on the horizontal bed and a one-piece over-

NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58.

arm, index worm gear case and work slide. For the ordinary run of jobs, operation will be semi-automatic—once the initial set-up is made, the operator merely loads and unloads the work and pushes the cycle lever. For high production runs on appropriate parts, the machine is designed to accommodate magazine loading, so that the operation is completely automatic.



Barber-Colman No. 8-12 production hobbing machine

The new No. 8-12 Machine handles work up to eight inches in diameter on some pitches and has a hob slide travel of 12 in. The maximum tooth form which can be hobbed under optimum conditions is 10 diametral pitch. Maximum hob diameter which can be used is 2¼ in. Standard machines will have spindle speeds from 150 to 1350 rpm, and the feeds per revolution of work range from 0.005 in. to 0.400 in.

E-171—Electronic Unit

The new NATCO A-42 electronic unit, designed and manufactured by the National Automatic Tool Co., Inc., Richmond, Ind., is a flexible, positive feed machine used for drilling, reaming, boring, facing and tapping operations.

This unit is adaptable for use in a wide variety of working conditions. Automatic work cycles such as rapid traverse forward, coarse feed forward, fine feed forward, dwell, rapid traverse, and stop, or rapid traverse forward, feed forward, feed reverse, rapid traverse reverse, and stop, and many other combinations of movements are readily accomplished.

A smooth positive feed movement is imparted to the tool slide through an anti-friction ball screw and nut assembly driven through a mechanical transmission by an electronically-controlled, variable-speed motor, which makes possible any feed rate adjustment within the feed range of the machine.

The slide is mounted on a wide way base equipped with hardened and ground steel ways of the narrow guide style which are automatically pressure lubricated at each cycle.

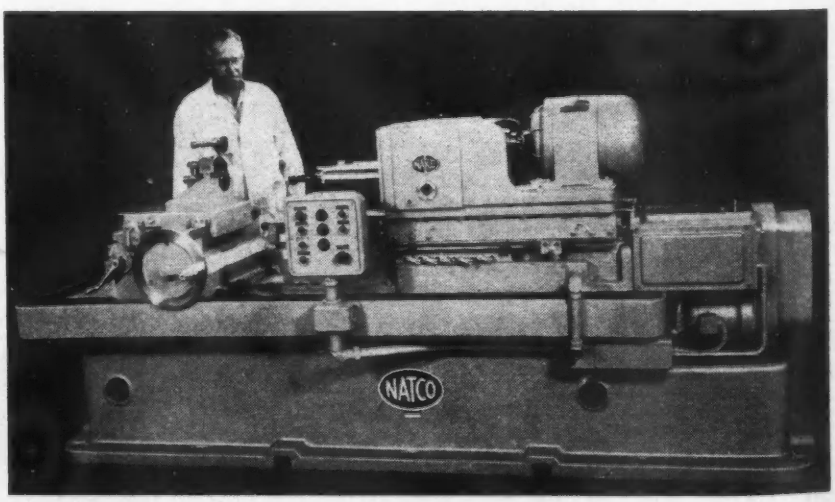
A spindle or combination of spindles in a head with a drive motor is mounted on the flat side. The head, of a style and size to suit the application, is directly driven through a flexible coupling by an electric motor (5 hp, 1200 rpm maximum).

A master control push button station is provided on machines with two or more units. For routine operation, all unit cycles are initiated simultaneously, however, independent control is provided for set-up purpose, permitting the cycling of each unit independently.

The NATCO A-42 electronic unit is flexible and completely self-contained, requiring only electrical connections. The unit may be mounted in any position, thus making possible the building of highly specialized machines made up of a combination of units for the high production of a wide variety of work.

E-172—Single Unit Drilling Machine

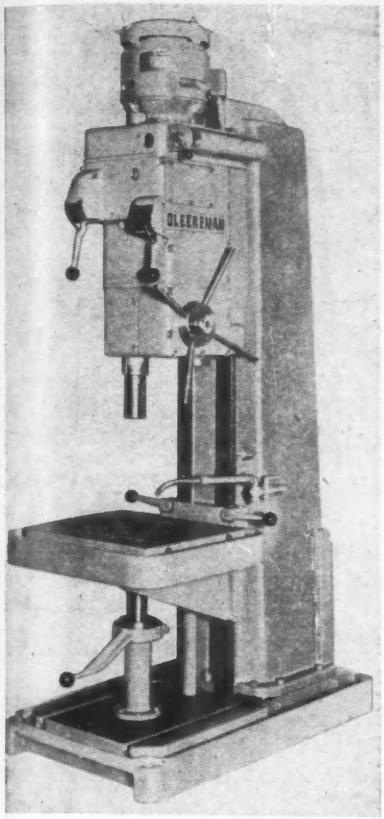
The new Cleereman Model 325 single unit sliding head upright drilling machine, made by the Cleerman Machine Tool Co., Chicago 6, Ill., employs a combination of proven engineering principles assembled in a new and different manner. The resulting performance is said to give simplicity of construction, extremely wide range of application and operating facility. An important development is the fully enclosed sliding head which includes not only the spindle and feed mechanism but also the motor and spindle speed transmission. Both head and large T-slotted table are adjusted vertically by hydraulic power. There is a wide range of six or 12 spindle speeds depending upon the electrical equipment



NATCO A-42 electronic unit

New Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58.



Cleereman Model 325 single unit sliding head upright drilling machine

supplied. Unique in a drilling machine is the instant availability of four quick change feeds by a single selector lever, which range can be varied by changing the pick-off gears. In addition any thread lead for tapping from six to 50 pitch can be provided. Attachments available include automatic tapping reverse, flanged quills for multiple heads, special spindle tapers or slots for driving keys, compound tables, a four-position depth stop that allows presetting to four individual depths of feed, etc. Multiple units can be had in combinations of two to six spindles or more.

E-173—Safety Device for Electrostatic Painting

The Harper J. Ransburg Co., Indianapolis 7, Ind., announces an additional safety feature for its electrostatic spray coating and dip-detearing processes.

The new safety control is an electronic "spark-guard" so sensitive that it can be set to anticipate an accidental "short" and de-energize the electrostatic field before a spark-over develops.

The new device will automatically stop the equipment should a piece accidentally approach the discharge electrode, either from swinging, from falling, or from some other dislocation.

In electrostatic spray, special discharge electrodes are energized through Ransburg equipment to bombard atomized paint with a negative charge as the particles enter the "coating zone." The product being painted passes through this zone on a conveyor, which, being electrically grounded, also serves to keep the piece at the opposite polarity to the electrodes.

This polarity differential creates a flow of charges and attracts the paint to the product with a "wrap-around" action.

In normal operation of this process, the likelihood of any spark occurring is minimized by installing the electrostatic equipment in accordance with rules established by the National Fire Protection Association. Under these rules, the electrostatic installation is engineered so that any part of the equipment which transmits electric current is separated from the products being painted or parts of opposite polarity by at least twice the possible spark-over distance.

The new "spark-guard," developed by Ransburg engineers, is designed to further minimize the sparking possibilities which result from the abnormal accidental reduction of this separation. It consists essentially of a self-contained control cabinet, power pack and electronic relays arranged to deenergize the field when accidental dislocation of a part reduces the separation below safe limits. The device also activates a bell and lamp to signal the operator, and can be wired to stop the conveyor or other equipment as desired.

E-175—Stack Lift for Carloader Truck

A new lifting mechanism combining a tiering height of 130 in. and overall collapsed height of only 83 in., was recently introduced by Clark Tructractor division of Clark Equipment Company, Battle Creek, Mich. Known as the "Hi-Lo-Stack," the new lift is designed for use on Clark's "Carloader" line of fork trucks.

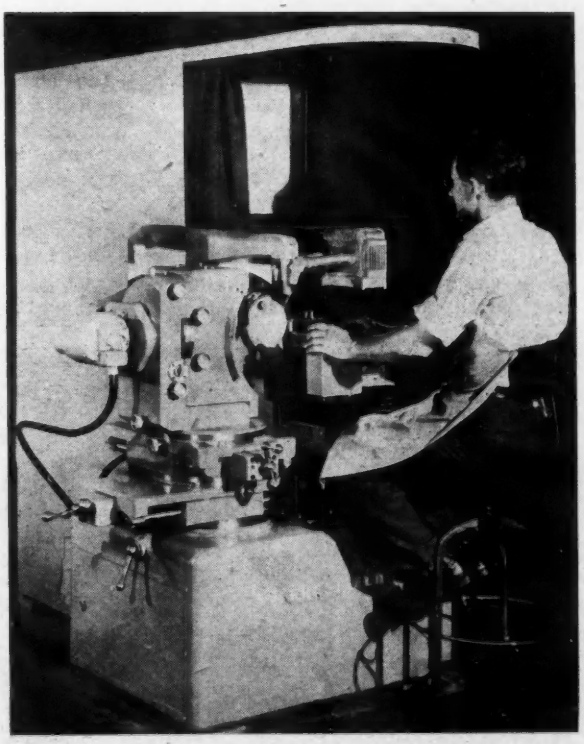
Among the features of this new device is the accomplishment of 63 in. of "free" lift. This results in the ability to raise the fork 63 in. from the floor before there is any increase in the minimum overall height of the machine, either of the upright or of the vertical face of the forks.

Simplification of design has made it possible to obtain these results with a single lift cylinder and a single set of uprights and inner-slides. In addition

E-174—Projectoform Grinder

This new Sheffield Projectoform grinder, built by the Sheffield Corp., Dayton 1, Ohio, offers many unusual features. The optical system uses either contour or opaque projection with surface illumination and 25 to 1 or 50 to 1 optional magnification. A prism incorporated in the optical system places the image in a natural position with the work so that confusing opposites in movement of work and projection are avoided.

All moving ways of the Projectoform Grinder are completely sealed with anti-friction bearings to insure firmness, rigidity, ease of movement and long life. Remote movement of the wheel head is accomplished hydraulically, allowing the operator to sit in a comfortable position before the projection screen while operating the conveniently placed micrometer wheels. He can see the work and wheel in natural colors highly amplified on the screen at all times.

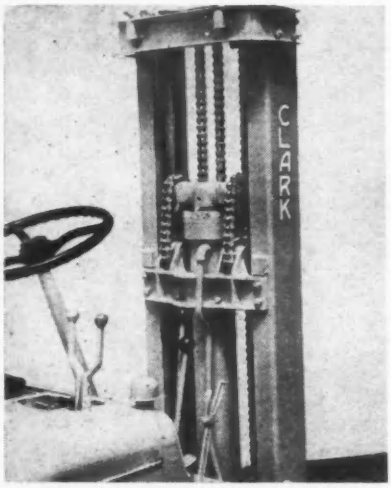


NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58.

the lift of maximum loads of 4000 lb is accomplished with extremely low hydraulic pressure in the lift cylinder.

The 83 in. overall height permits easy passage through 7-ft door openings.



Hi-Lo-Stack lift for Carloader fork trucks

The 63 in. of "free" lift make it possible to tier material to box car ceilings without interference from uprights, and the 130 in. of maximum lift permits the most effective use of "air rights" in warehousing operations.

E-176—New Grinding Machine

A new method of cylindrical grinding, called Consta-Contac grinding, by which three or more parts are in constant contact with a single grinding wheel, is used in an automatic valve face grinder developed by Fitchburg Grinding Machine Corp., Falulah Rd., Fitchburg, Mass. The machine will grind automotive engine valves at the rate of 2100 per hr according to the manufacturer. This high production rate is possible because three valves are in contact with the wheel, "sparking" at all times. Thus, although the actual sparking time for any part is the same as in ordinary cylindrical grinding, the new Fitchburg Consta-Contac method grinds three parts during the sparking time of a single part. Both loading and unloading are automatic.

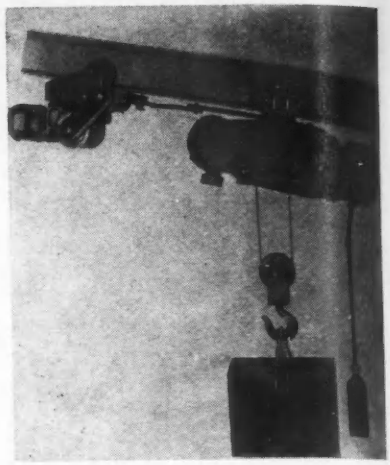
The unique feature of the grinder is in the way the valves are fed to grind to size while they pass through a 90-deg sector of the wheel face. The arrangement of the machine comprises a vertical grinding wheel, belt-driven and a vertical turret having 12 driving spindles to receive the valve stems. The spindles are quill type, self-contained, and are powered by a 1-hp motor working through a friction drive. The turret is belt-driven by another 1-hp motor. The wheel rotates at 5000 sfm and the valves at 80 to 110 sfm.

E-177—Monorail Tractor

A new idea in traction effectiveness has been included in the Trojan electric motor traveled, monorail tractor introduced by the Detroit Hoist & Machine Co., 8226 Morrow St., Detroit 11, Mich.

This tractor, suspended on a pair of wheels that run on the top surfaces of an overhead, monorail beam flange, is so fulcrumed that its own weight exerts a pressure against a second pair of wheels which run on the underside of the flange. The result is an effective "biting action" that permits a relatively small, light-weight tractor to haul comparatively heavy loads even up inclined monorails.

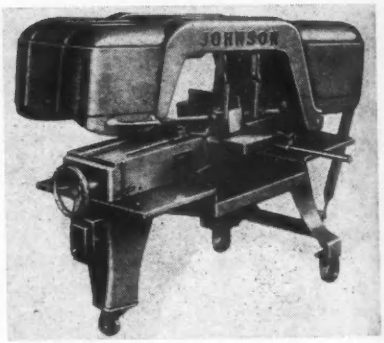
The Trojan tractor can be applied to travel existing hand operated monorail hoists by power and to travel monorail conveyor lines. In slightly altered form it can be applied to travel existing hand operated crane bridges by power.



Detroit monorail tractor pulling loaded hoist

E-178—Wet Model Horizontal Band Saw

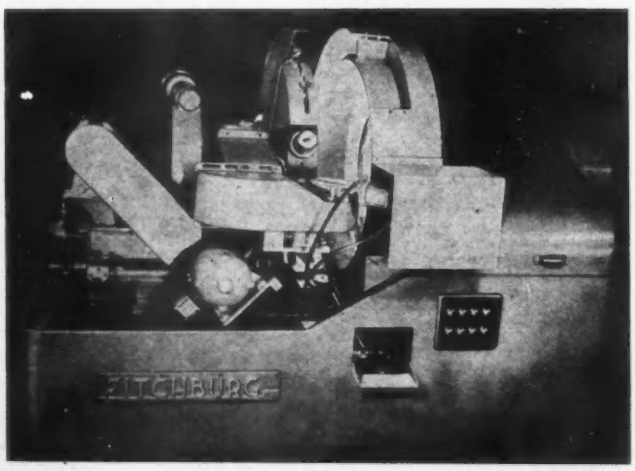
The Johnson Manufacturing Corp., 624 Chrysler Bldg., New York 17, N. Y., announces a new wet model horizontal band saw, 10 in. by 18 in. capacity, for production cutting. This new machine permits the handling of certain types of production work and higher speed cutting than is practical on the dry model Johnson band saw.



Johnson wet model band saw

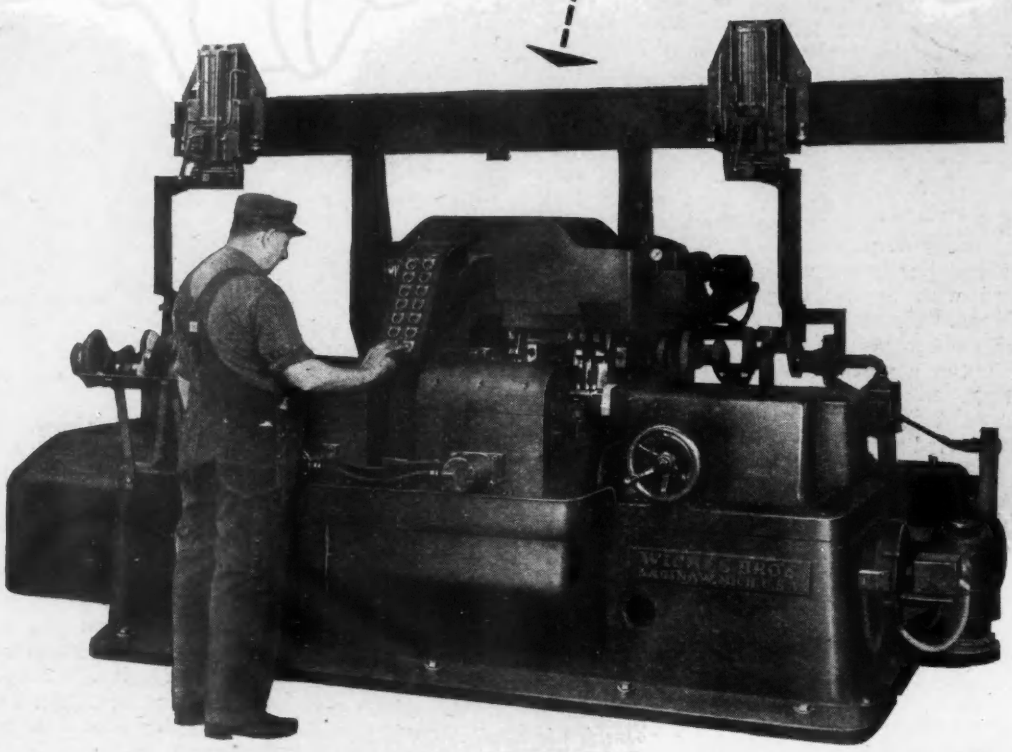
The wet model gives maximum cutting efficiency without impairing the simplicity of operation. Production is said to be increased on certain jobs by as much as 200 per cent, together with longer blade life.

The coolant is a complete unit that operates continuously without difficulty. Coolant flow plays directly on the cut as the nozzle is fastened to the back of the front saw guide and never needs adjustment. Pump starts and stops automatically as it is integral with machine and is easily disconnected for dry cutting if desired. A special feature is the removable coolant receptacle which can be pulled completely out and removed for cleaning and draining.



Fitchburg grinding machine

NEW! Rough and Finish Turn Crankshaft Bearings in One Chucking



WICKES Combination Model CH-4 Automatic Center Drive Lathe

Specially designed for high production of automotive and similar crankshafts, this new Wickes Combination Model CH-4 Automatic Rough and Finish Turning Hydraulic Center Drive Lathe accurately performs all turning prior to hardening or finish grinding on all main line bearings and ends of cranks. The machine is completely automatic in operation, rough turning the bearings first with divided tools both front and rear and then automatically shifting the finishing tools into position and finish turning complete with divided tools both front and rear. One operation of chucking, locating and handling of the crankshaft is therefore eliminated. All latest features such as power operated loading devices, synchronized variable speed and feed mechanism, power locking chucks, etc. are available. It will pay you to submit your crankshaft machining problems to us. We build a complete line of crankshaft turning equipment, including standard crankshaft lathes. Write for complete information.

WICKES

WICKES BROTHERS • SAGINAW, MICHIGAN • RECOGNIZED QUALITY SINCE 1854

NEW Products

For additional information regarding any of these items, please use coupon on page 58.

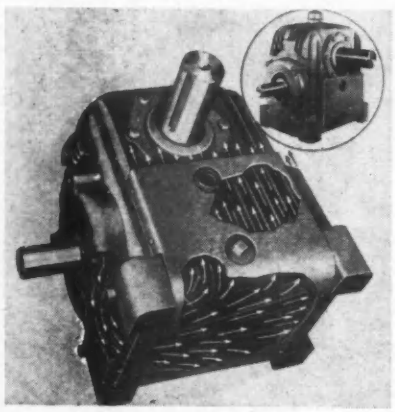
F-105—Fan-Cooled Speed Reducers

A line of scientifically designed fan-cooled Cone-Drive speed reducers is announced by the Cone-Drive Division, Michigan Tool Co., Detroit 12, Mich. The line is available in the following sizes:

Center Distance (inches)	HP Rating @ 1750 RPM 5:1	60:1
4	19.8	2.54
5	37.0	4.75
6	59.1	7.87
8	119.2	16.2

The standard heavy-duty pinion-under Cone-Drive speed reducers were originally designed with applicability to fan cooling in mind. Thus, the basic units of the new fan-cooled reducers are identical with the non-fan-cooled models of this type. Standard Cone-Drive HU models already in service can be readily converted to fan cooling at any time, if desired, by the addition of the Cone-Drive fan and air-flow control shields.

Horsepowers given above apply



Cone-Drive speed reducers with shields cut away to show air-flow control

equally to mechanical or thermal ratings and have not been increased over the mechanical ratings specified for equivalent size non-fan-cooled units. The various reducers are available in standard ratios of 5, 10, 15, 20, 25, 30, 40, 50 and 60 to 1. The 5, 6 and 8 in. reducers are also available in a 70:1 standard ratio. All models are pinion under (FHU—heavy duty).

Removable shields direct the fan impelled air over the finned lower portion of the speed reducer housing in such a manner that equalized air-flow is said to be obtained at all points of the housing requiring cooling. The fins are so located and shaped as to guide the streams of air for maximum cooling efficiency.

Removal of the shields makes the entire housing accessible for cleaning when required. The impeller and shields may be removed if it is desired to operate the reducer in another location without fan cooling.

The shields are removed by unfastening a number of screws which attach them to the housing. The fan is attached to the standard pinion shaft by means of a set screw and key, using the extra long keyway standard on these reducers.

Addition of the air-flow control shields for fan cooling does not increase the outside dimensions of the speed reducers. Thus, the housings for the 8 in. reducer with its 131 hp rating at 1750 rpm (70:1) is only 29 in. high, 16⅝ in. wide, and 21⅝ in. across. Other sizes of fan-cooled reducers have proportionally smaller dimensions.

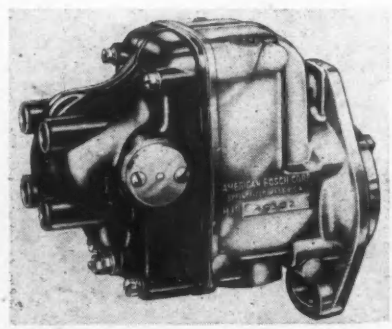
F-106—New Bosch Magneto

American Bosch Corp., Springfield 7, Mass., has announced a new series of magnetos especially applicable to farm tractors and industrial engines of small and medium size.

Small in size and designed for a broader range of application than previous American Bosch MJ types, the new MJH series is available for 1-, 2-, 4- and 6-cylinder engines.

It employs an oil-impregnated stationary winding and an Alnico magnet rotor. The 1- and 2-cylinder gearless types are equipped with ball bearings on the drive end of the rotor shaft, while those with gear-driven distributor rotors have ball bearings at both ends of the magnet rotor. The breaker assembly is removable as a unit, and once the contact points are aligned on the assembly, no further alignment is necessary after installation of the unit in the magneto.

MJH magnetos are available in vertical flange or base mounted types, with

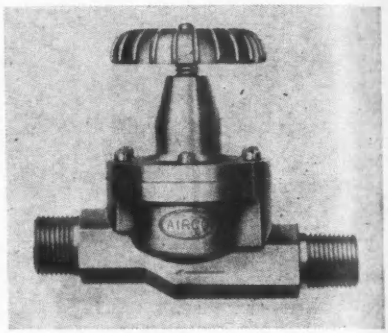


Bosch MJH series magneto

or without standard American Bosch ICA or ICB impulse couplings, and may be had in radio-shielded executions.

F-107—Station Outlet Valve

Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., has just brought out a new ½-in. station outlet valve. The new valve is a compact combined shut-off and check valve for use on drops or risers of a piping sys-



Airco ½ in. station outlet valve

tem. It is a diaphragm type, and therefore being "packless" has no stuffing box. Performing a dual function, Airco's new station outlet valve eliminates the necessity of installing a separate shut-off valve and check valve.

As a shut-off valve it permits repairs or alterations to be made on equipment downstream from the valve without disturbing other stations on the line; as a check valve, it allows the flow of gas in only one direction and it will close tightly should a disturbance at the torch cause a back-pressure to travel as far as the valve.

The body, bonnet and handwheel are brass forgings. Several outlets can be connected to one service drop — each outlet being entirely independent of the other.

F-108—Decimal Sized Reamers

The Twentieth Century Manufacturing Co., 3742 Montrose Ave., Chicago 18, Ill., offers decimal sized reamers under and over the regular standard sizes, ranging from 0.0461 to 0.0501 in. Over 509 different sizes are available as stocked reamers. Special sizes from 0.0501 to 1.510 in. are available. All diameters are held to plus 0.0002 in. and minus 0.000.

F-109—Crankshaft Gage

A new crankshaft gage, permitting convenient and accurate journal measurement in the engine, is now available through Federal-Mogul Service, Coldwater, Mich.

Employing the functions of two basic geometrical figures—the right triangle

(*Turn to page 56, please*)

USER REPORT

.."a driver in our service has never had an accident due to brake failure."

Sunset MOTOR LINES
COVERING THE GREAT SOUTHWEST WITH DEPENDABLE DAILY SERVICE
GENERAL OFFICE
SAN ANGELO, TEXAS
June 24, 1947
Warner Electric Brake Mfg. Co.
Beloit, Wisconsin
Gentlemen:
In 1936 we purchased our first Warner Electric Brakes and have several trailers still operating daily with the original brakes. The only service required on these brakes has been to reline the bands.
We have 65 trailers in our operation all equipped with your electric brakes. These trailers operate over approximately 2000 miles of Texas highways, principally, between Houston and El Paso.
To my knowledge, a driver in our service has never had an accident due to brake failure. This is truly an enviable record.
We thought you would like to know about our experience with your electric brakes.
Yours very truly,
SUNSET MOTOR LINES
W. D. BRADLEY, PRESIDENT
WDB:jo
W. D. BRADLEY, Pres.
SUNSET MOTOR LINES
MOTOR LINES
59

The experience of Mr. Bradley and the Sunset Motor Lines, during 11 years of every-day use of Warner Electric Brakes on their tractor-trailer fleet, is typical of the kind of service you, too, can expect when your trailers are equipped with Warner Electric Brakes.

They provide an entirely new concept of effective stopping power. Being electrically operated there is no time lag in getting instantaneous action regardless of the distance between cab and rear trailer wheels. They develop their stopping power within the brake itself. Always *controlled* braking power — driver sets "Vari-load" dial on dash to meet load and road conditions.

For maximum performance and satisfaction, standardize on WARNER ELECTRIC BRAKES. Write for illustrated literature, explaining all their many advantages.

WARNER ELECTRIC BRAKE MFG. CO.
BELOIT, WISCONSIN

..65 trailers WARNER EQUIPPED never in an accident due to Brake Failure

WARNER
THE ORIGINAL AND PROVEN
ELECTRIC BRAKES
SINCE 1927

NEW Products

For additional information regarding any of these items, please use coupon on page 58.

(*Continued from page* 54)
and the circle—the new gage is said to give quick, simple, accurate measurement.

After removal of the main bearing cap, the gage is placed against the journal. A simple but precise plunger-and-lockscrew device gets the journal

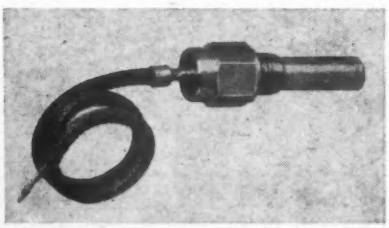
Federal-Mogul Service crankshaft gage

radius. By applying a micrometer to the gage and doubling the reading, the diameter is obtained. Taper can be checked by applying the gage at both ends of the journal. Out-of-roundness can be detected by rotating the shaft and taking a series of readings.

Federal-Mogul Service offers the new gage in three sizes, for crankshaft diameter ranges of 1.970 to 2.550 in., 2.470 to 3.250 in., and 3.220 to 4.125 in.

F-110—Small Thermal Control

Control Products, Inc., 306 Sussex St., Harrison, N. J., is now producing a small thermal control and limit switch known as the Plug-Stat. The device is designed to provide a thermal switch to warn when excessive temperatures were reached in automotive



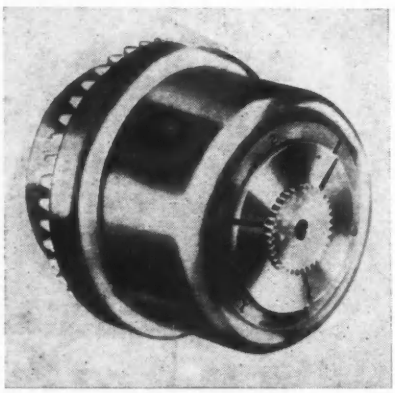
The Plug-Stat

gear boxes, railway journal boxes, thrust and roller type bearings, and as an indicator for high or low temperatures in fluids under pressure or static fluids such as oil in crank cases, water in cylinder blocks, and exhaust stack temperatures.

The Plug-Stat can be installed by drilling and tapping either a ⅛-27 N.P.T. or by drilling and tapping an N.F.-2, ⅜-24 thread. Its thermal characteristics are as follows: control range, minus 60 to plus 600 F; amplitude of operation, plus or minus 3 deg F; electrical characteristics a-c or d-c 28 volts 2 amp, one side normally grounded to case.

F-111—Small Precision Chuck

The Edward Blake Co., 634 Commonwealth Ave., Newton Center, Mass., is marketing a new device called the Bordjaw chuck. This is a small-lathe precision chuck, similar in many ways to a collet chuck. It does not draw back when closed. The only movement is lateral. The chuck can be faced and can be bored after mounting on the



Bordjaw chuck shown holding small gear

lathe. In this way, it is always true with the lathe. The jaws can be rebored at any time for any other larger size. Different sets of jaws can be kept for jobs which are to be repeated later.

Another feature is the possibility of boring jaws to take thin pieces which insures not only concentricity but accurate facing so the pieces held in the jaws can be machined with parallel faces. If necessary jaws can be machined to hold special shapes. The body of the chuck is marked so numbered jaws can be removed from chuck and replaced without loss of accuracy.

F-112—Two New Houghton Products

E. F. Houghton Co., Philadelphia 33, Pa., offers a new water-soluble Perliton liquid carburizer. This salt bath is usable up to 1575 F, which enables case depths up to .035 in. to be obtained in three hours. Parts coming from this carburizing bath are cleaned readily and thoroughly in hot water. A uniform, deep carburized case is said to be obtained.

Also, an improved cold strip coating for metal parts, providing protection against corrosion and abrasion, is another new Houghton product. This is a vinylite plastic coating known as Houghto-Kote Cold Strip and may be used in protecting sheets against scratching during forming or stamping operations, as well as for protective packaging or storage of parts.

New British Turbo-Prop Engine Announced

A 1590-hp turbo-prop engine for aircraft was introduced in Great Britain recently by D. Napier and Son, Ltd. The new engine, called the Naiad, is a combination turbo-prop and jet propulsion unit, and marks the Napier Co.'s entry into the gas turbine field. Measuring only 28 in. in diameter, it utilizes an axial-flow compressor, five parallel-sided combustion chambers and a two-stage turbine to drive a four-bladed propeller. Exhaust gases are ejected through a jet nozzle which provides a residual thrust equivalent to about six per cent of the maximum power output. Maximum power developed at take-off is reported to be 1500 bhp at 18,250 rpm (sea level), plus net jet thrust of 241 lb. Fuel consumption at maximum cruising output (902 bhp at 17,000 rpm plus 268 lb thrust) is given as 96.2 gal per hr.

The Naiad is equipped with a hollow ducted spinner which permits full utilization of the ram effect. Air enters through the annular opening between the inner cone of the spinner and the outer spinner ring, and passes directly into the axial-flow compressor. Then it is fed into the five combustion chambers arranged revolver-wise around the turbine shaft. The gases finally pass into the two-stage turbine and out through the jet pipe. The section of the unit ahead of the compressor contains the reduction gear and accessories drives, with the accessories grouped around the compressor casing. The exhaust jet can be fitted with a two-position control for the orifice area.

The new turbine is started by an electric motor and a single igniter plug. A second igniter is provided, but this is held in reserve. The main auxiliaries are a 24-v starter motor, two fuel pumps, oil and metering pumps, oil filter, propeller governor and braking control. In addition, a long horizontal shaft can be provided to drive a remote gear box for accessories. Length of the Naiad, from spinner to turbine outlet flange, is 102 in.; and weight is 1095 lb.

The Naiad has not yet flown; however it is expected to find application in the two-engine Airspeed Ambassador, in which the Centaurus engines would be replaced by four Naiads.

POWER

EXIDE BATTERIES... for dependable Diesel cranking power

In all climates, at all seasons, in all kinds of weather... thousands of Exide Batteries are proving that their extra power and ruggedness are equal to any Diesel cranking job. They are proving it on trucks, buses and off-the-highway equipment... on ships and railroad locomotives... in power plants and many other applications. They are proving that for dependability, long life and ease of maintenance, you can always count on Exide Diesel Cranking Batteries.

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PUBLICATIONS AVAILABLE

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D-77—Precision Grinding Spindles

Ex-Cell-O Corp. — A new 80-page, easy-to-use catalog lists Ex-Cell-O Precision Grinding Spindles, spindle brackets and quills; gives information on their application to grinders, new and old. The index lists spindles by manufacturers of grinders for purchasers of replacement spindles and also by type of spindle for designers of new machines. Drawings and charts show all pertinent dimensions notes explain application to individual grinders. Included are spindles for internal grinders, universal grinders, surface grinders, tool and cutter grinders and special applications. Both belt-driven and inbuilt motor spindles are shown.

D-78—Wrenches

Blackhawk Manufacturing Co. — A new 36-page catalog, No. 247, lists socket, box-type and open end wrenches and sets, including the new Nugget double-duty drive socket wrenches.

D-79—Vibrator Data Book

P. R. Mallory & Co., Inc.—Vibrator Data Book, a new work, discusses fully a wide range of design and application problems for vibrator and vibrator power supply. It contains 135 pages of text illustrated with many charts and diagrams. It contains descriptions of basic structures, designs and vibrator characteristics, and discusses fully the selection of correct types for specific problems; outlines the latest information on applications; describes and illustrates the circuits involved and covers in detail the modern inspection procedures. The text is complete and easy to understand and is amplified with tables, charts, graphs and formulas. It is available directly from P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind., at $1.00 per copy.

D-80—Portable Hydraulic Elevating Tables

Lyon-Raymond Corp.—A new 8-page bulletin describes Portable Hydraulic Elevating Tables, giving full descriptions of the various models offered, photographs showing the table in use for die handling, strip and sheet feeding, etc. Descriptive copy supplements the illustrations of each table.

D-81—Spot and Projection Welders

Progressive Welder Co. — An illustrated 12-page booklet, Bulletin No. 603, describing the complete new line of press type spot and projection welders, and containing information of value to purchasing agents as well as to design engineers, has been published. Tables of specifications, installation dimensions and rated spot welding capacities, data on standard features and standard extras, etc., are included, as well as numerous line drawings illustrating the theory and application of spot and projection welding, as well as phantom views to show details of machine construction.

D-82—Tenite

Tennessee Eastman Corp.—A revised edition of the book, Tenite, concerning cellulose ester thermoplastics has been released. The new book tells what Tenite is, how it is made and for what kinds of applications it is suited. Physical properties are enumerated and a tabular summary of Tenite properties is included. Uses of Tenite are discussed under various headings, an 11-page index showing typical uses appears at the back of the book; molding and extrusion are defined and described in a general way.

D-83—Wheelco Capacilog

Wheelco Instruments Co. — Bulletin C2 describes the design, operating and specification data pertaining to the new Wheelco Capacilog, an Electronic Scriber. Measuring, indicating, recording and controlling functions are fully explained with principal components clearly illustrated and defined through the use of open cut photographs and line drawings. A price list is included.

(*Turn to page 74, please*)

TIME SAVER COUPON for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR new Production and Plant Equipment OR New Products items described on following pages.

Automotive Industries,
Chestnut & 56th Sts., Philadelphia 39, Pa.

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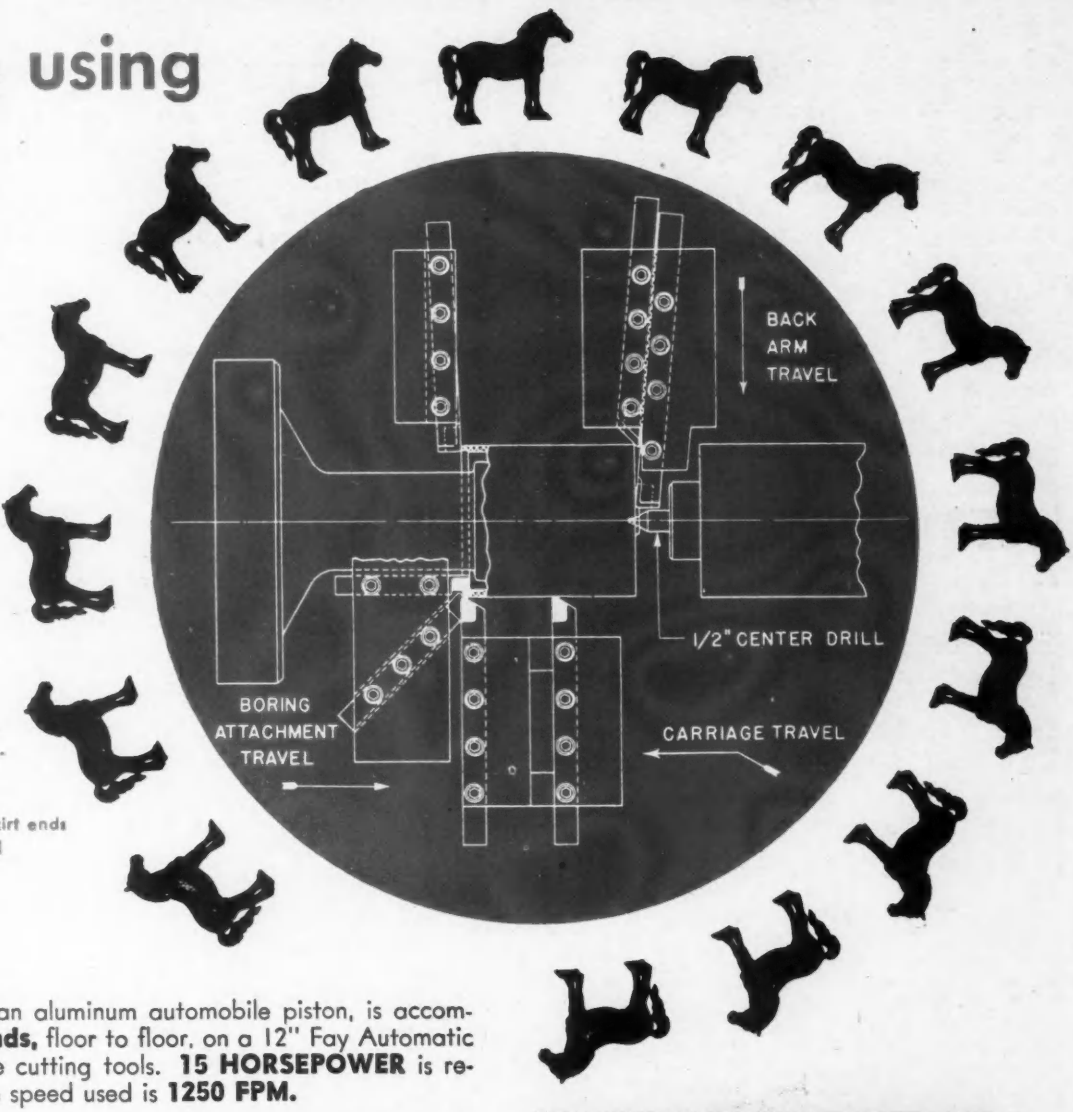
How much **HORSEPOWER** are You using ?



1st. Operation on an Aluminum Automobile Piston:—
Rough turn O.D.
Face head and skirt ends
Center closed end
Rough bore skirt
Finish bore skirt
Chamfer skirt

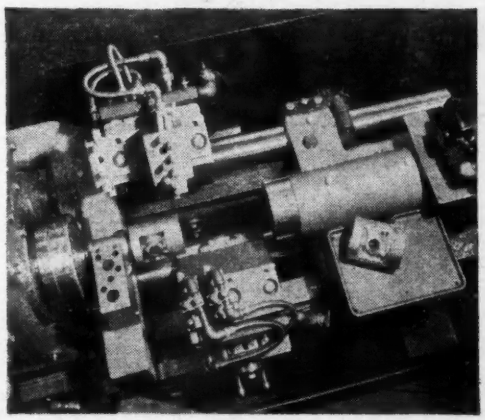
This operation, on an aluminum automobile piston, is accomplished **in 15 seconds,** floor to floor, on a 12" Fay Automatic Lathe using carbide cutting tools. **15 HORSEPOWER** is required. The surface speed used is **1250 FPM.**

Carbide cutting tools have increased horsepower requirements as much as 300 per cent. They have increased cutting speeds 200 to 500 per cent.

Be skeptical of the production efficiency of your metal turning equipment. The chances are that turning accounts for 25 per cent or more of all machining time in your plant—that this is your major producion expense.

There are cases in our files of savings of hundreds of dollars a month in the manufacture of a single part by the efficient use of carbide cutting tools on Jones & Lamson machines. Our Turret Lathes and Fay Automatic Lathes are designed specifically for the most efficient use of these tools.

Send for our folder "Machining Automotive Pistons". Or better yet, telephone or write for a Jones & Lamson engineer who will be glad to consult with you on all phases of your metal turning problems.



JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Manufacturer of *Fay Automatic Lathes* and Universal Turret Lathes •
Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies

Gasoline Injection Truck Engine

(*Continued from page* 40)

the diaphragm by compression of the over-riding spring. The amount of excess fuel can be limited by a screw adjustment on the over-riding control housing. Also, a hand throttle control is fitted in the intake manifold. This control consists merely of an air bleed adjusted by a lever. There is no mechanical linkage between the accelerator pedal and the hand throttle.

The feed pump is of the diaphragm type and is bolted directly onto the front of the injection pump housing. It is operated by an eccentric on the camshaft, and is self-regulating to a pressure of about five psi. It is provided with a hand priming lever.

General design of the new gasoline engine is shown in Fig. 4. In converting from the Diesel engine the intake manifold was redesigned to give maximum volumetric efficiency, since with fuel injection there is no need for high air velocities in the manifold. Also, within the range of air-fuel mixture employed, there is no need for the addition of heat to the incoming air. Accordingly, the air intake has been located outside the hood; and the exhaust manifold is water cooled to reduce under-hood temperatures and to prevent vaporization in the fuel system.

The cylinder block and crankcase is a chromium-iron casting fitted with centrifugally-cast flangeless-type dry cylinder liners. The compression ratio is 6.92 to 1, and the combustion chamber is partly formed by the piston which has a symmetrical concave head. Ignition is provided by means of a C.A.V. 12-v high-tension coil and 14 mm sparkplugs.

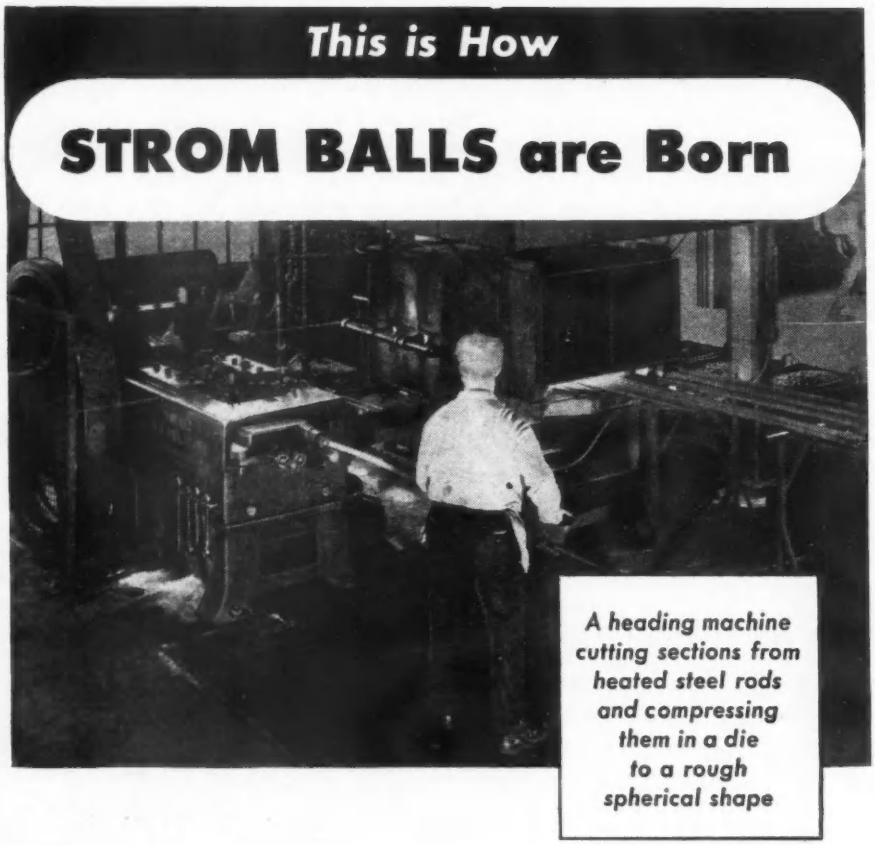
A seven-bearing Nitralloy steel crankshaft is fitted in conjunction with steel-back white-metal-lined bearings. The H-section connecting rods are manufactured of one per cent chromium steel and have steel backed bearings lined with lead bronze on the rod half and white metal on the cap half.

Aluminum alloy pistons with solid skirts are fitted, each having three compression rings with a radial thickness of D/26 and one slotted oil control ring fitted above the piston pin bosses. Provision is made for another control ring to be fitted in the skirt below the piston pin, if required, when oil consumption increases.

There are several interesting features in the cylinder head design of this engine. Each of the two chromium-iron head castings is held to the cylinder block by 14 studs. Along the near side is a machined face against which the exhaust manifold is bolted. In this face are the exhaust ports and the large openings through which the cooling water from the head passes to the water-cooled exhaust manifold. Cooling water is led from the water pump to a point near the back of the cylinder block. After circulating around the cylinder bores it passes into the cylinder heads through holes in the faces of the block and heads, 12 holes in the exhaust side and six on the inlet side. Above these holes are jets which direct the water on to the valve seats and spark-plug bosses. The water then passes out of the side openings in the heads, over the exhaust manifold and back to the radiator header tank. An incidental advantage obtained with these large openings is the ease with which sand and core wires can be removed from the casting.

A road test was conducted with the new Thornycroft gasoline-injection engine installed in a fully-loaded vehicle of 48,280 lb GVW. Results were reported to be highly satisfactory.

Drawings in this article were reproduced by courtesy of *The Automobile Engineer* (London).



A heading machine cutting sections from heated steel rods and compressing them in a die to a rough spherical shape

The steel is carefully chosen and inspected, even before it gets to the heading machine. After being "born" here, balls are carefully "brought up," through a long series of grinding and lapping operations, to the unbelievably high standards of finish, sphericity and precision which have made Strom Metal Balls the standard of Industry. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Illinois.

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A NEW LINE OF PRECISION CONTOUR TURNING AND BORING MACHINES

Accurate and Fast — Cam and Air Actuated

Featuring **1.** An endless variety of contours or combinations may be generated with a single-point tool. Besides all the regular jobs of straight precision boring and turning, facing and chamfering, it will produce lands, recesses, flanges, steps, counterbores, and radii.

2. A disc type cam for each table gives positive action consistently throughout the day — from the first to the last piece — uninfluenced by temperature changes.

3. Through positive cam action, tool approaches on rapid traverse to within .005 of the work and immediately starts to feed. Tool may cut on feed-in or drawback stroke, or both for rough and finish cuts. On return stroke, tool jumps clear eliminating drag off marks, When moving between intermittent or successive cuts, tool goes into rapid traverse.

4. Uniform temperature, anti-friction bearings, and super-precision spindles provide spindle speeds up to 7,500 RPM. Mechanical precision chucking operated by air cylinders. Neither chucking nor unchucking operation affects preload or position of spindle bearings.

5. Only one dimension need be inspected on any one set-up, regardless of the number of diameters produced by any one single-point tool. Cams control and positively repeat from piece to piece.

6. Set-up of machine depends entirely upon nature of job. Work may be rotated in spindles or mounted on table, loaded from the front of the spindle or through the spindle. Spindles may be raised, lowered, or separated. Two spindles are standard, but more may be added. Changing job set-up simply requires replacing two cams, setting tool for size and changing chucks.

Model 36

THREE OTHER NEW MACHINES

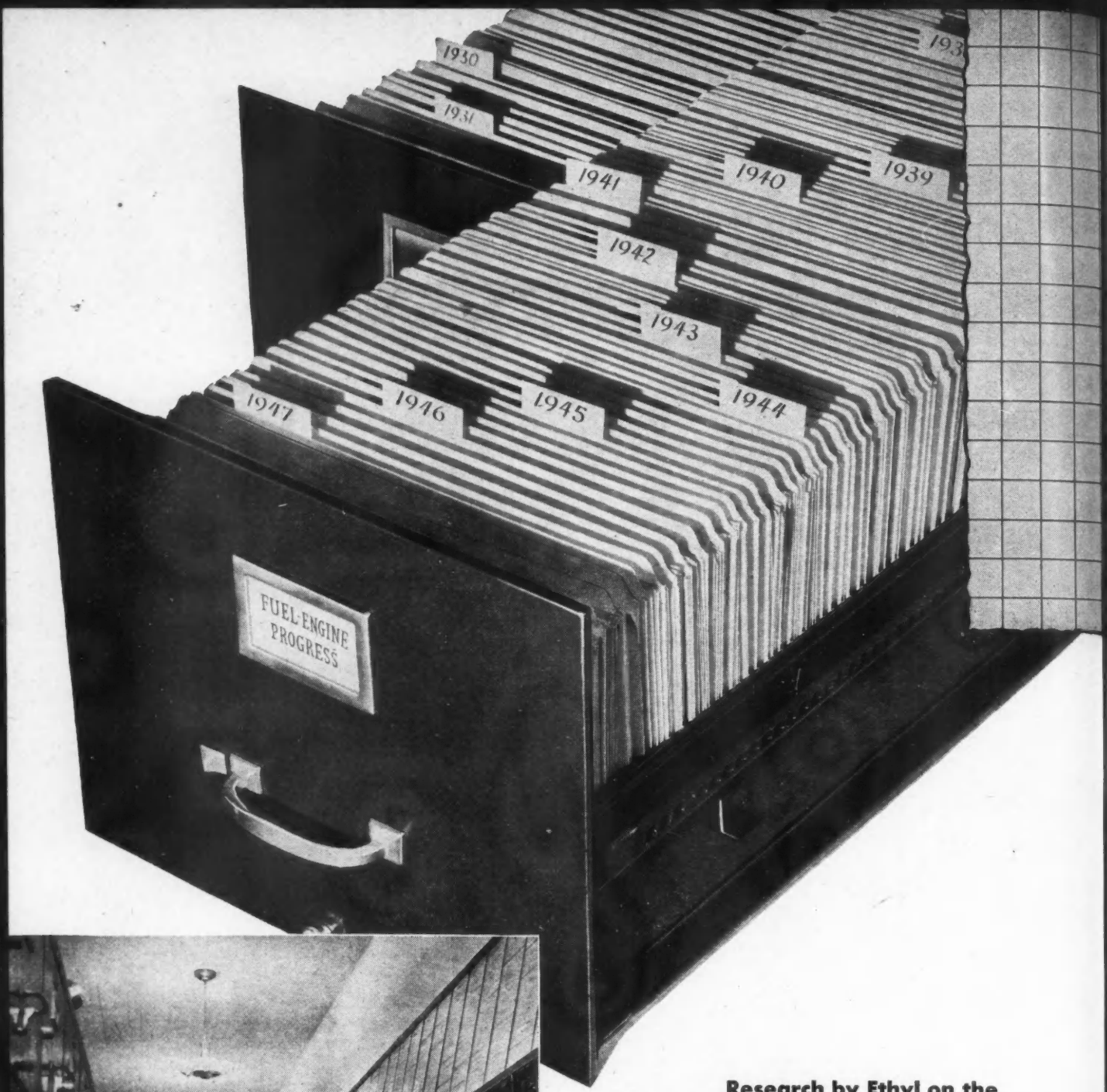
Latest additions to the New Britain line include: The new, faster, more powerful line of automatic screw machines designed to make the most of carbides on long and short runs, the Model 365, tool rotating, double end chucking machine — and the new line of automatic turret lathes.

THE NEW BRITAIN MACHINE CO. NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT



A view in one of the file rooms of the Ethyl Corporation Research Laboratories. The fundamental data contained here provide a comprehensive background for research on the problems involved in the development of engines, fuels and lubricants.

Research by Ethyl on the relationships between fuels and engines covers a span of more than twenty years

MANY OF the conquests and disappointments, the triumphs and troubles that have been encountered in the coordinated development of automotive engines, lubricants, fuels and antiknock compounds during the past quarter of a century are recorded in the file rooms of Ethyl Corporation's Detroit Laboratories.

A great store of fundamental data has been accumulated during this period, providing a comprehensive history of one of the principal fields of automotive progress. But these data are more than a history of the past; they are a foundation for the study of current and future problems involving the interrelationships of fuels, lubricants, and engine design and materials.

Recent automotive progress has emphasized the

RECORDS OF THE PAST . . .

A FOUNDATION FOR THE FUTURE

need for more knowledge of the nature of fuel-engine-lubricant relationships. A look at the early literature makes it clear that these three factors were not always understood to be interdependent. Nowadays, for example, the choice of materials for engine construction cannot be based solely on such considerations as structural strength; there may also be chemical problems involving the reaction of each material with the constituents and combustion products of base gasolines and lubricating oils, and with their additives.

Data for the Future

The material in the Ethyl files includes the results of research on engines having advanced characteristics, such as supercharging and higher compression ratios, operated on tomorrow's fuels . . . road tests under conditions ranging from those of city driving to service over the mountains and deserts near San Bernardino, California . . . other road tests on vehicles in commercial fleets in widely different types of service . . . evaluation of gasoline composition in its relation to antiknock value . . . investigations on specific engine parts and materials, such as pistons, rings, valves, spark plugs, etc., under a wide range of engine temperatures, power output, and fuel consumption . . . composition and manufacture of antiknock fluids . . . to name but a few.

The data on these interrelated subjects are cross-indexed for ready reference and convenient use. Material from these files is used constantly in the study of engine and fuel problems and in the planning of cooperative research projects with automotive and oil companies.

ETHYL CORPORATION

RESEARCH LABORATORIES
1600 West Eight Mile Road
Detroit 20, Michigan
2600 Cajon Road
San Bernardino, California

Automatic Transfer Machines

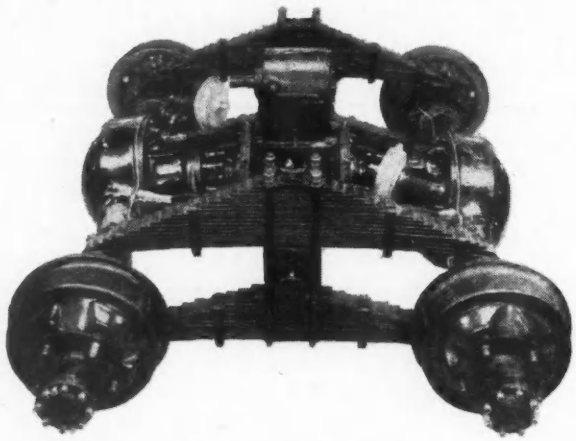
(*Continued from page* 34)

to be in an annealed condition. The entire part is hardened, without the complication of masking, then the gear is placed in the annealing machine to soften the internal spline. Another part processed through the machine is a hardened shaft having a threaded end. The shaft is hardened in its entirety without masking, then the threaded end is annealed.

Some time ago, it will be recalled, The Michigan Tool Co. brought out a revolutionary method of cutting gears —the Shear-Speed gear shaper. Two of these machines, one illustrated here, are installed on the gear line and are used for cutting the shoulder gear of a cluster. This technique, according to the management, produces excellent gear quality at an exceptionally fast rate.

The transmission case now in production is made in two sections, the bell housing being a separate casting. Much of the machining required on the bell housing is done in the enormous five-station Baush machine shown here. Its operation is entirely automatic, the only function of the operator being to load and unload the work at the central No. 1 station. At Station No. 2 a vertical head rough bores a 4½ in. cored hole while two angular heads tap drill two letter "F" holes. Station No. 3 consists of a vertical unit which drills six 17/32 in. holes; eight 25/64 in. holes; and combination drills and reams two .375 in. dowel holes. Station No. 4 spot-faces six one in. diam bosses using a vertical unit. Station No. 5 incorporates a vertical and two angular units where the 4½ in. cored hole is finish bored to 4.749 in. diam and the two letter "F" drilled holes are tapped to a 5/16-18 thread.

LOOKS RUGGED? . . .



— WELL IT IS!

TOUGH going!—that's what this big tandem axle of the Detroit Automotive Products Corp. is built to withstand. It will take the heaviest loads at high speed or over rough terrain—but what a beating the springs get! That's why they're TUTHILL Springs.

The four powerful TUTHILL Leaf Springs pictured above have the lasting temper and resilience of all TUTHILL products. Laboratory control of alloy steel quality and special pyrometer controlled heat treatment — contribute to the tough, flawless quality of TUTHILL Springs.

Spring design is a specialist's business.
Consult our Engineering Department.

TUTHILL SPRING CO.
760 W. Polk St.
CHICAGO 7, ILL.

Quality Leaf Springs for Sixty-Seven Years

Quality Control

(*Continued from page* 29)

of showing in advance the trend in dimensional variations resulting from chance causes such as dulling of tools, for example. By close observation and experience it is possible to forecast when the tool must be changed to preserve dimensional accuracy. Because of this close control many operations requiring 100 per cent inspection heretofore are now handled by sampling, which gives better quality.

One specific example will illustrate the principle and what it has accomplished. The wheel adjusting nut is subjected to considerable end thrust while the vehicle is cornering and, accordingly, it has been found desirable to hold the pitch diameter of the thread to close tolerances. Since dimensional quality of this part left much to be desired in the past, this was the first piece to be subjected to statistical quality control. One of the problems was the shortcoming of the conventional go and no-go thread gage. If the threads had nicks, the gage rejected the part as undersize. When the corrective expanding operation was applied the nuts were rejected as being oversize to the extent of the size of the imperfections.

The first step, therefore, was to design a new type of gage, Fig. 1, which is said to be free from the tendency to give false impressions of imperfections and to indicate a true reading of pitch diameter, thus reducing the number of rejects.

The next step was to build up a control chart, Fig. 2, giving the upper and lower process control limits about a mean value—the standard control chart method. This made it possible to study the process as it was and make certain adjustments to stabilize it. For the first week the variations were quite marked, as is to be expected. During the second week, as improvement in the process took effect, the upper and lower

(*Turn to page* 67, *please*)

Quality Control

(*Continued from page* 64)

limits were recomputed twice to record progressive decreases in the variations about the average value. By the third week, the process had been shaken down to an orderly routine as shown on the chart. By that time it was noted that although process limits could be held to remarkably close limits, the improved control made it perfectly feasible to open up the limits to relieve the manufacturing department. The increase in the limits is shown in the section of the chart at the right.

The net result of this investigation —taking only a matter of three weeks— was to reduce rejects to the vanishing point, eliminate expanding operations, and cut the cost of the job. Moreover, both quality and performance in the field were improved without resorting to a possibly sizeable investment in new machinery.

French Racing

(*Continued from page* 45)

manifold in the angle formed by the two cylinder blocks, the exhausts are on the outside, the exhaust pipes being carried through the side rails. The steering column passes through the angle formed by the cylinder blocks. Not only is the engine short by reason of the V construction, but the maximum height of the hood does not exceed 28¾ in.

The power plant is mounted centrally, but is inclined 8 per cent from front to rear to give a lower seating position for the driver. A normal multiple-disk type clutch is used. The five-speed transmission, carried in an aluminum housing, forms a part of the rear axle and is suspended with the axle. There is a gear reduction at the back of the engine, and between it and the propeller shaft, with special provision made for easy change of ratio to suit racing conditions. The transmission and the final drive are lubricated under pressure on the dry sump principle—pressure and scavenger pump.

Of more than ordinary interest is the special chassis, with side rails and cross members built up in chrome molybdenum steel with an average thickness of 0.039 in. This is purely an aircraft job and could not have been produced in any automobile factory. Everything possible has been done to obtain the highest torsional rigidity. Even the light alloy drip pan under the engine adds to chassis rigidity. The four exhaust pipes on each side pass through the side rails, without coming in contact with them, and without any loss of rigidity.

In addition to the chassis cross members, there are four box-section hoops, in light chrome molybdenum steel, forming instrument panel, back rest for the driver's seat and a front and a rear member. These add enormously to the rigidity of the chassis and although not designed for that purpose, it is probable that the car could roll over on them without any serious damage. The whole of this frame work has been carried out in the French State Aeronautical Arsenal.

Front and rear wheels are sprung independently by torsion bars, those at the front being in the axis of the chassis and the pair at the rear being transversal. The springs provide a high degree of flexibility and are supplemented by De Ram hydraulic shock absorbers and a set of friction shocks. Final drive from the suspended differential housing to the rear wheels is by transverse shafts with double universal joints. Tires are 5.00-17 in front and 7.00-16 at the rear. The light alloy brake drums with set-in liners are limited in diameter only by the size of the wheel. The brakes are Lockheed operated, with a separate cylinder for each shoe.

Wind tunnel tests have been carried out on a model, but before this was done a long series of tests had been carried out on full sized cars and on models of the same, so that the engineers were in possession of a coefficient taking into account the influence of revolving wheels and the passage of air through the radiator. The net result is a racing car with a very low drag.

BUT . . .

. . . Today's giant high-speed, automatic marvels have left it far behind. As in printing progress, so it is in the field of metal cleaning and conditioning.

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is the modern method for cleaning and conditioning metal surfaces—removing oil, grease and other undesirable soil. DURIDINE also phosphatizes—creates a durable bond for inorganic finishes by changing the metallic surface into a non-conductive phosphate film of uniform crystalline texture.
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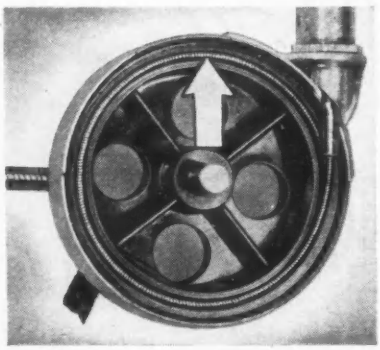
There's a message of interest to you in this telescoping radio antenna. You'll find it in the S.S.White flexible shaft control. The advantages of this control for accessories requiring operational adjustments can be appreciated from a glance at the illustration. It permits both the antenna and the control knob to be mounted wherever desired. This makes the antenna adaptable to all types of cars and other motor vehicles. S.S.White shaft and casing combinations can be supplied in any required length. And in every case smooth, easy operation is assured because S.S.White remote control flexible shafts are specially engineered and built for this kind of service.

S.S.WHITE FLEXIBLE SHAFT CONTROL

As the reel is turned by the remote control shaft, another S.S.White shaft, operating "push - pull," extends and retracts the antenna sections.



GET FULL DETAILS IN THIS 260-PAGE FLEXIBLE SHAFT HANDBOOK

It gives full engineering information and data about flexible shafts and explains how to select and apply them for specific purposes. Copy sent free if you write for it on your business letterhead and mention your position.

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES

Moderate further reductions in general business activity are indicated. The *New York Times* index for the week ended Sept. 6 stands at 140.8, as against 143.2 for the preceding week and 132.8 a year ago.

Sales of department stores during the week ended Sept. 6, as reported by the Federal Reserve Board, equaled 265 per cent of the 1935-39 average, as compared with 337 in the week before. Sales were unchanged from the corresponding distribution a year earlier, as against a preceding decrease of one per cent. The total in 1947 so far reported is seven per cent greater than the comparable sum in 1946.

Electric power production declined slightly in the week ended Sept. 6. The output was 12.8 per cent above the corresponding amount in 1946, as compared with a like advance of 12.2 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 809,050 cars, 12.6 per cent less than the figure for the week before but 1.8 per cent above the corresponding number recorded last year.

Crude oil production in the week ended September 6 averaged 5,173,050 barrels daily, or 16,200 barrels more than the preceding average and 373,100 barrels above the comparable output in 1946.

Production of bituminous coal and lignite during the week ended September 6 is estimated at 10,650,000 net tons, 11.5 per cent less than the output in the week before. The total production in 1947 so far reported is 17.1 per cent above the corresponding quantity in 1946.

Civil engineering construction volume reported for the week ended September 11, according to *Engineering News-Record, is* $146,229,000, or 19 per cent more than the preceding weekly figure and 70 per cent above the comparable sum in 1946. The total recorded for 37 weeks of this year is 0.6 per cent more than the corresponding amount in 1946. Private construction is seven per cent below that a year ago, but public construction has increased by 13 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended September 6 is 154.9 per cent of the 1926 average, as compared with 154.0 for the preceding week and 122.0 a year ago.

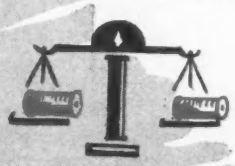
Member bank reserve balances increased $304 million during the week ended September 10. Underlying changes thus reflected include a decline of $151 million in Reserve Bank credit and a decrease of $216 million in Treasury deposits with Federal Reserve banks, accompanied by a reduction of $7 million in money in circulation.

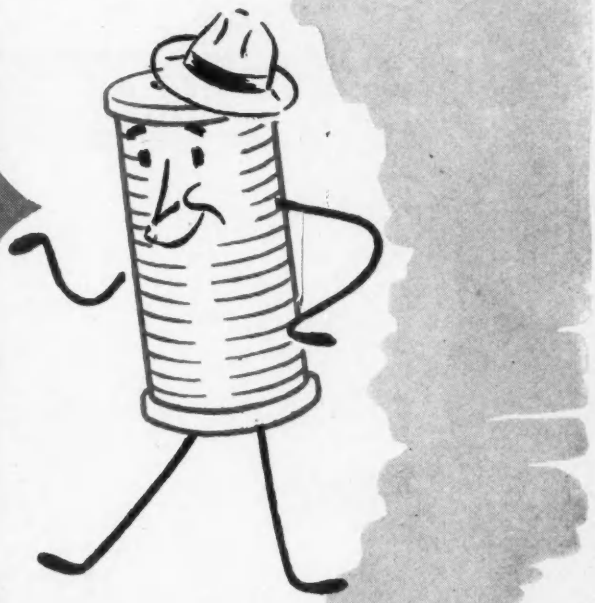
Total loans and investments of reporting member banks increased $69 million during the week ended September 3. An increase of $112 million in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $12,518 million, shows a net increase of $2,948 million in 12 months.

I make a bond that's strong and fast
A metal joint that's bound to last

With many laboratory checks
And strict control I'm held to specs

With each re-order, pound or ton
My composition varies none





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Federated can supply you *promptly* with the best in solders—acid core, rosin core, solid wire, bar, and body. For unusual applications *any* solder can be alloyed to your specific requirements. When you need him the friendly Federated service man is ready to answer your solder questions, or help you with any non-ferrous problem. *Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, New York.*

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AMERICAN SMELTING AND REFINING COMPANY

PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

Ford Motor Co.—**I. L. Pierce** has been made director of the Service Dept.

* * *

Willys-Overland Motors — **Benjamin C. Bowker,** appointed Director of Public Relations; **Loren E. Boysel,** Body Engineer. **Charles S. Dennison** has been made Sales Manager of the Willys-Overland Export Corp.

Oldsmobile Div., General Motors Corp.—**N. T. Witt** has been appointed to handle special assignments in the Sales Promotion Dept.

* * *

Chevrolet Motor Div., General Motors Corp.—**T. W. Putnam** appointed supervisor of National Fleet Service.

* * *

Kaiser-Frazer Corp.—**Ralph H. Isbrandt,** Chief Chassis Engineer and **John C. Widman,** Chief Body Engineer.

* * *

General Electric Co.—**C. H. Auger,** appointed to head-up production engineering on both aircraft gas turbines and turbosuperchargers. **J. S. Alford** has been placed in charge of development engineering for aircraft gas turbines. **R. C. Robin,** head of engineering general services.

* * *

Plymouth Div., Chrysler Corp.—**H. B. Daniels,** named Director of Regions.

* * *

The Glenn L. Martin Co.—**Frank Cuccia,** Director of Procurement.

* * *

Lockheed Aircraft Service, Inc.—**Colonel Luke Harris,** elected a Director and Vice-President in charge of Sales.

* * *

The Firestone Tire & Rubber Co.—**Roger S. Firestone** named President of the Firestone Plastics Co., a new subsidiary.

* * *

The Buda Co. — **Harry G. Campbell** has been made Sales Manager of the DieseLight Div., handling sales and manufacture of Diesel electric and gasoline electric generator sets.

* * *

Kellog Div., American Brake Shoe Co. —**Charles S. Sliter,** Asst. General Sales Manager.

* * *

Ethyl Corp.—**Grover C. Wilson,** Co-Ordinator on the automotive research staff.

* * *

The Aro Equipment Corp. — **Colonel Rudolph Fink,** Manager of Aircraft Div.

* * *

Vogt Manufacturing Co. — **Raymond A. Lander,** elected President, succeeding **Albert E. Vogt,** recently deceased.

* * *

The Budd Co.—**Carl J. Koelsch,** Steel Buyer, Detroit Div.

* * *

Baker Brothers, Inc.—**George E. Hallenbeck,** made Chairman of the Board; **A. L. Baker,** elected President and General Manager; **Herbert L. Tigges,** elected Executive Vice-President; **R. K. Chapman,** re-elected Secretary and Treasurer; **M. E. Fischer,** elected Vice-President in Charge of Manufacturing; **Thomas L. Hallenbeck,** elected Vice-President and Director of Enginering. **Glo Temple** continues in the position of Chief Engineer.

* * *

The Peninsular Grinding Wheel Co.—**William Schenck,** Comptroller.

* * *

Lindberg Enginering Co.—**L. W. Hayden,** Vice-President.

* * *

United States Rubber Co.—**E. M. Cushing,** Industrial Relations Director; **Russell Wilks,** Public Relations Director; **H. Barden Allison,** appointed Sales Manager, Gilmer Div.; **William M. Dougherty,** appointed Assistant to the President.

* * *

General Tire and Rubber Co.—**Dwaine Edsall,** Production Manager, Akron Plant.

* * *

The Yale & Towne Mfg. Co.—**Mark A. Miller,** General Manager of the new Specialty Div.

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...and each is a PATTERN of PERMANENCE

THESE three distinguishing features have made the Aetna "T" Type Bearing a symbol of rugged endurance—have made it the trusted choice of most vehicle builders for that hard worked Clutch Release position.

- **permanent alignment of the raceways — no eccentric thrust, no chatter, no excessive wear**
- **the oil-impregnated bronze retainer—smooth, silent bronze-to-steel contact**
- **permanently sealed-in lubricant**

It helps any vehicle attain peak performance to equip it with the Aetna "T" Type Bearing.

A wise step upward is to consult with Aetna engineers—costs nothing, may well lead to vital economies.

MAKERS of THRUST BALL BEARINGS, Standard and Special · ANGULAR CONTACT BALL BEARINGS · ROLLER BEARINGS Special, · BALL RETAINERS, HARDENED and GROUND WASHERS

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On shaft-turning, grooving, facing, angle-turning or between-center chucking jobs, you can multiply your present output with the new BULLARD Man-Au-Trol 3-Spindle Horizontal Lathe—and reduce costs proportionately.

But that's only part of the economy-story. You'll find this latest BULLARD machine a radical departure from conventional design, with many improvements contributing to better workmanship and further savings in time and money.

NO OTHER SHAFT-TURNING LATHE OFFERS ALL THESE ADVANTAGES

All 3 spindles are equipped with hydraulic, centering-type, lever-gripping chucks. These chucks function two ways: a center extends to pick up the work, which is then gripped by two hydraulically operated levers, eliminating the use of driving dogs.

Man-Au-Trol control, head stock and all other machine-operating controls are located at operator's right.

Each hydraulic chuck is operated by an individual foot-treadle, allowing operator unrestricted use of both hands.

Both saddle and tool slide travel on vertical bearing ways, entirely free of the chip area.

An automatic feed interrupter breaks the chips to desired lengths for easy removal from the chip receiver.

Vertical construction of saddle and saddle ways allows chips to fall freely into receiver without accumulating around operating parts.

Work and tools are always visible and easily accessible to the operator without reaching across tool slide and tools.

Massive weight and firm application of all components provide extreme rigidity, assuring minimum vibration and maintained accuracy.

PLUS THE ADVANTAGES OF BULLARD MAN-AU-TROL

Man-Au-Trol has given complete proof on other BULLARD lathes of its amazing ability to lower costs by upping productivity, versatility and accuracy. When in manual operation for shorter runs, functions are performed faster than with most types of manually operated lathes. On longer runs of ten or more pieces it enables quick conversion to 100% automatic operation. Controlling the head through *39 separate functions in any sequence*, it enables the machine to cut practically continuously. With the lathe set for fixed maximum production, there are no stops for customary manual operations, no loss of time due to the human element, and output is stepped up 4 ways:

1 *Lightens Labor's Load* because the operator machines the first piece under manual control while easily setting the operations for automatic cycle . . . then merely loads, supervises and unloads when Man-Au-Trol's 100% automaticity takes over.

2 *Makes One Machine Do More* because it automatically machines any class of work within manual-control range . . . is instantly convertible to manual operation on the same or a different piece without affecting the automatic cycle.

3 *Cuts Automatic Set-Up Time* because set-up time from one class of work to another is only slightly more than for a manually operated machine.

4 *Reduces Spoilage* because it operates continuously to a degree of accuracy manual operation cannot duplicate.

So, while retaining the versatility of manual control for short runs, this new BULLARD Man-Au-Trol machine can be quickly changed to fully automatic operation on production of 3 identical parts at once — substantially lowering manufacturing costs. Why not find out how this revolutionary, cost-saving combination can benefit your own production? Engineering data and other facts on the new BULLARD Man-Au-Trol 3-Spindle Horizontal Lathe gladly sent on request. THE BULLARD COMPANY, Bridgeport 2, Connecticut.

TO MAKE MACHINES DO MORE

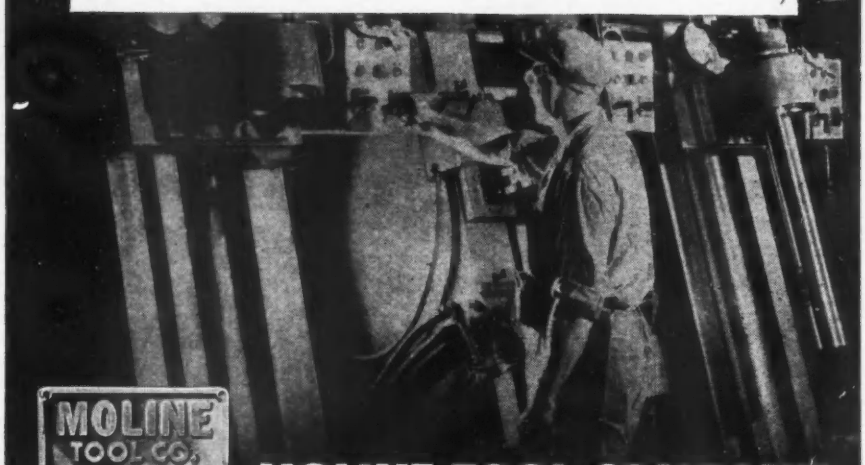
If you have a SPECIAL PROBLEM

in any of these operations, where precision work is demanded and where greater production at man-hour savings is paramount—

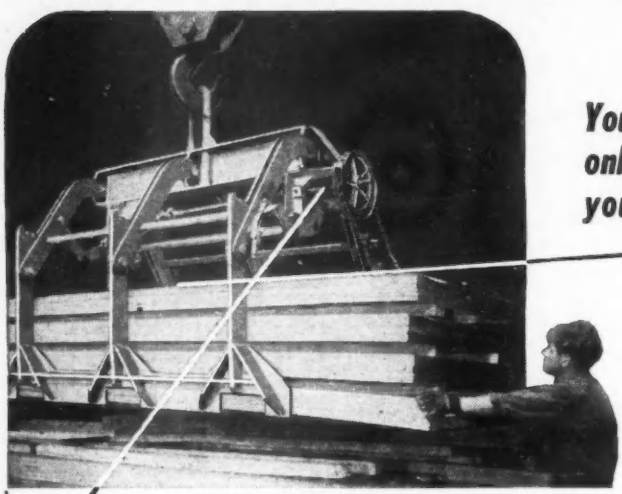
• BORING—rough, semi-finish and finish • MILLING (special types) • STRAIGHT LINE DRILLING • UNIVERSAL ADJUSTABLE SPINDLE DRILLING • HONING • TAPPING • REAMING • COUNTERBORING • VERTICAL AND WAY-TYPE EQUIPMENT . . .

then a Moline Multiple Spindle Specially Designed machine tool is your answer. Moline tools are ruggedly built and engineered to fit your PARTICULAR requirements, they're made to last for years, they're easy to change over to other jobs, they do better work at less cost and stand up to it longer.

For YOUR special problem, go "HOLE-HOG," write us for any information you may need.



MOLINE TOOL COMPANY
100 20th Street Moline, Illinois



You can produce only as much as you can handle*

WHEN you use C-F Sheet Lifters to load, carry and unload loose or bundled sheets in and out of storage, you keep no machine or operator idle, waiting for material.

C-F Lifters provide a faster, safer and more economical method of handling sheet stock because they carry more sheets per load, have a tong action that grips loads tightly, preventing stock slippage or sag, yet design features such as wide bearing surfaces give full protection to stock edges. One man end or remote cab control keeps operator away from sides—stock can be loaded or unloaded in close quarters with resulting savings in storage room.

Jaw controlling mechanism provides infinite adjustments from minimum to maximum widths. Control is fast, positive. C-F Lifters have standard and optional equipment that will exactly meet any materials handling requirement you may have. Lifters are available in capacities from 2 to 60 tons or larger, in standard or semi-special designs. Write for new Sheet Lifter Bulletin — just off the press. CULLEN-FRIESTEDT CO., 1322 S. Kilbourn Ave., Chicago 23, Ill.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

PUBLICATIONS

(*Continued from page* 58)

D-84—Speed Drives

Reliance Electric & Engineering Co. —Bulletin No. 311-A covers the company's all-electric adjustable speed drives in the higher horsepower ratings. The features of the V-S drive system are described and their applications given. Equipment involved for operation from A-C, 2-phase or 3-phase 60-cycle, 220, 440 or 550-volt circuits is listed in detail.

D-85—Air Cooled Engine

Salsbury Motors, Inc. — A 4-page folder describing construction, operation and industrial applications of its Model 600 6-hp, air-cooled engine, has been issued. Illustrations, power curves and dimension drawings supplement the detailed description of this lightweight power plant.

D-86—Pines Benders

Pines Engineering Co., Inc.—An informative 18-page catalog describes the construction features of the various models and types of Pines bending machines. In addition, typical applications and various types of bends are illustrated.

D-87—New-Matic Measuring Machines

Merz Engineering Co.—A new 20-page booklet explains and describes the Merz New-Matic Measuring Machines. Point-to-Point Gaging, Balanced-Air, etc., are illustrated and described, together with typical examples of Merz Measuring Machines in action.

D-88—Durez Resins

Durez Plastics & Chemicals, Inc.—A new 4-page bulletin contains a brief, simple outline of the various Durez phenolic resins available today and their uses for making compounded rubber stocks and solvent-type adhesives.

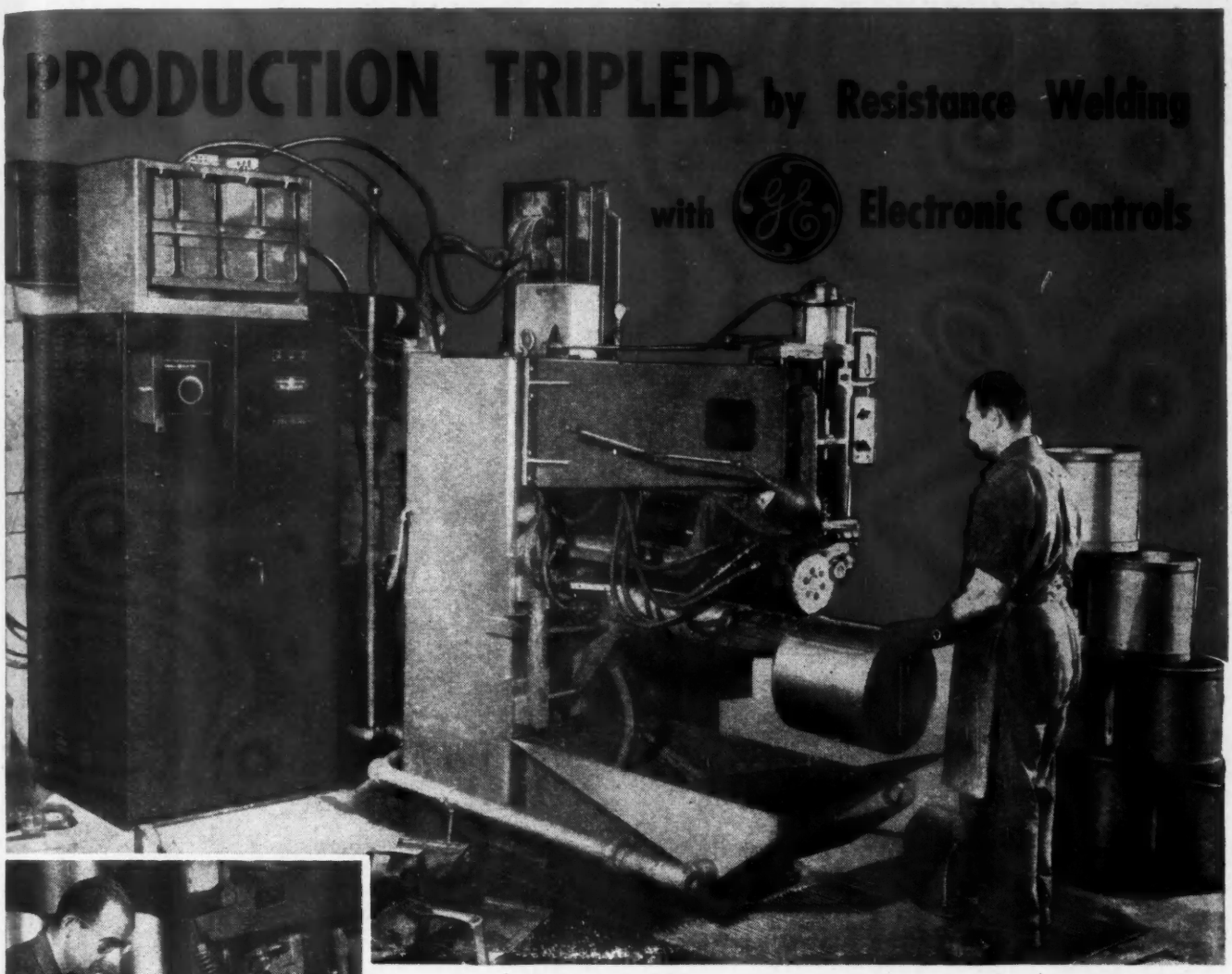
Bundy Tubing to Build Plant in Pennsylvania

Bundy Tubing Co. of Detroit has signed an agreement with Panther Valley Industrial Association for construction of a new plant at Hometown, Pa. Production in the new plant will begin early next year.

Auto-Lite Building Wire Plant in Hazleton, Pa.

The Electric Auto-Lite Co. has its 28th manufacturing plant under construction in Hazleton, Pa. Covering hundreds of thousands of square feet, the new plant will be used to make automotive wire and cable.

PRODUCTION TRIPLED by Resistance Welding with G-E Electronic Controls



By shifting from acetylene welding to resistance welding with G-E controls, Tarrant Manufacturing Co., Saratoga Springs, N. Y., has tripled their production of road maintenance equipment.

Actual increase in production rate is even greater. It took three minutes to acetylene weld the bottom seam of the roofer's bucket pictured above; now, it takes 20 seconds. G-E controls assure automatic and accurate timing of the welding cycle; thus, faster, more consistent welding.

Large Welder Operates on Low-capacity Power Lines . . . Thanks to Series Capacitors

No Large Voltage Drop . . . Unity Power Factor

This large welder operates on low-capacity power lines, with no large voltage drop, thanks to G-E series capacitors. They reduce the normal welder demand from 100 kva to 40 kva, and correct the power factor to unity. There is no light flicker in the plant or surrounding residential area. For details on series capacitors, ask for Bulletin, GET-1134.

New Lines of Synchronous and Nonsynchronous Controls

1. Control is factory-assembled in one, easy-to-install cabinet.
2. Easy servicing through large side door of cabinet.
3. Control station always faces operator.

For further details, ask for Bulletins GEA-4699 and GEA-4726.

HAVE YOU SEEN

"This Is Resistance Welding", G.E.'s 30-minute, full-color movie? Your nearest G-E office, local utility, or resistance welder manufacturer representative will be glad to arrange a free showing.

GENERAL ELECTRIC

Apparatus Department, Sec. L 645-43
General Electric Company
Schenectady 5, New York

Please send me the following bulletins:

- ☐ GEA-4699, Synchronous Precision Control for Spot and Projection Welding
- ☐ GEA-4726, Nonsynchronous Control for Spot and Projection Welding
- ☐ GEA-4571, The Importance of Control
- ☐ GET-1134, Application of Series Capacitors to Resistance Welding Machines

Name.....

Company.....

Address.....

Pontiac's Facilities

(*Continued from page* 44)

The unloader operates whenever the molding flask is filled, delivering only enough sand to charge the mold.

Before reaching the mold the sand is aerated and cooled and kept in a free-flowing condition just prior to the time of being used. The supply of sand on the belt conveyor is constantly and automatically equally proportioned to each storage hopper regardless of the number on the line.

New Parts Warehouse

The new parts warehouse placed in operation early this year offers speedy service for everyone concerned with keeping Pontiac cars in good service condition. It is housed in an exceptionally modern building constructed during the war for the production of aerial torpedoes for the U. S. Navy. With the end of the war this building became available for its important peacetime duty.

Boasting an area of 352,000 sq ft, the parts warehouse serves as the principal clearing house for shipments of parts and Pontiac unitized service kits to the network of 42 existing GMPD (General Motors Parts Division) distribution branches, and eventually to four more now in the process of construction. In addition, the warehouse is in position to make large bulk shipments to Pontiac distributors or dealers in special cases. Modern in its conception and fitted with the latest types of storage bins, the warehouse is capable of handling some 10,000 different part numbers and already is making shipments at the rate of 50 million lb per year.

It features a complete mechanization of all functions, boasting long monorail conveyor lines which feed parts such as large sheet metal units from the main plant, distributing them to storage. Belt conveyors and gravity roller conveyors are employed widely for assembling unitized kits and packing them for shipment.

Unitizing Department

The unitizing department is located in a central position of the warehouse, thus facilitating efficient handling and delivery of parts to all sections of the building. Peak efficiency is made possible by the modern handling methods used throughout. As material on the unitizing list is required for shipment it is delivered to the unitizing department on pallets and other completely portable equipment.

Small parts, such as bearings, gaskets, piston pins and rings, are utilized on the shorter conveyor, while more bulky parts such as hub caps, bumper bars, clutch plates, and grilles, are handled on the longer one. Each package is labeled with information showing quantity, group number, part number and description of the contents. Four addressograph machines are required to take care of the labeling. Completely packaged units travel to the end of the conveyors where they are picked off and delivered to stock ready for shipment.

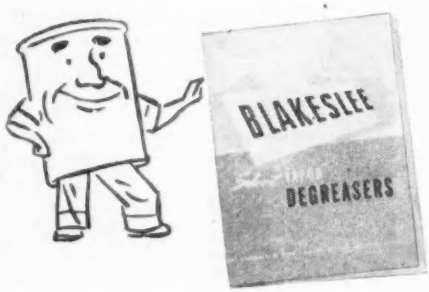
From a merchandising standpoint alone, unitizing is the key to the sale of additional related parts. The car owner is assured of replacement of all worn parts wherever they are needed on his car. Parts handling by the dealer is simplified by enabling the parts salesman to make one trip instead of several in order to fill the customer's requirement. The customer is assured of a complete job in which all component parts are the same as original equipment.

In serving as a central warehouse an important function of the organization is to keep careful watch on the consumption of parts that wear out or require regular replacement and to place orders in advance to assure an adequate supply of wanted parts at all times. GMPD orders are given immediate attention by tying the entire nation-wide network together by means of the GM central communications department. Here, teletype orders are received from individual stations and transmitted immediately to Pontiac for attention.

LARGE CASTINGS — SMALL METAL PARTS — LONG THIN PIPES ARE THOROUGHLY AND QUICKLY CLEANED IN A

BLAKESLEE

SOLVENT *Vapor* DEGREASER



Special jobs and difficult jobs are easily handled in Blakeslee Solvent Vapor Degreasers. The inside of tubing up to 40 feet long with a diameter as low as 1/8 inch may be thoroughly cleaned and dried.

Blakeslee Degreasers insure cleaning of all surfaces, cracks, spot welded seams; preventing bleeding of oil from hidden surfaces. This complete cleaning eliminates carry over of oils and greases to acid and plating tanks, and does away with rejects resulting from inferior cleaning methods. Removal of polishing and buffing compounds is another perfect application of Blakeslee Degreasers.

Write today for Fi 3 booklet on Degreasers and applications with Blacosolv the all-purpose degreasing solvent.

G. S. BLAKESLEE & CO.

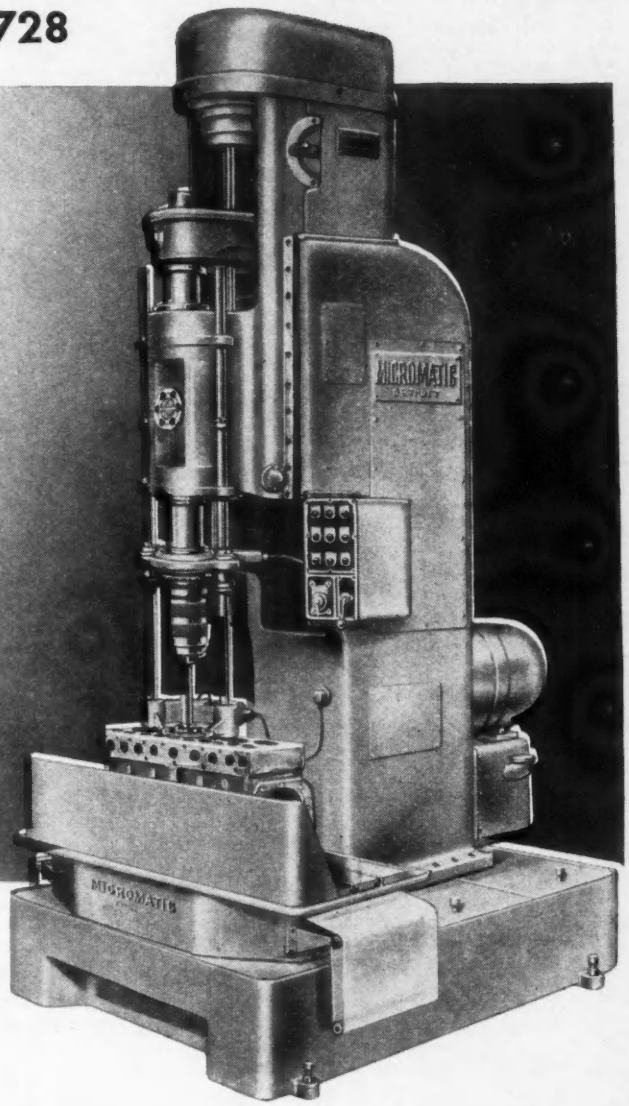
BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

New MICROMATIC QUILL-TYPE HIGH PRODUCTION HYDROHONERS

MODELS 723, 724 and 728



THESE new spindle-in-quill, unit constructed, hydraulically actuated, heavy duty Hydrohoner machines are designed for Microhoning bores from ¼ in. to 4 in. in diameter, in lengths from ⅛ in. to 9 in. in high production. When equipped with the latest electronic MICROSIZE control, uniform size is automatically and dependably generated within 0.0001 in. to 0.0003 in.

Important advantages are gained by the spindle being in the quill: torque and thrust are taken about the centerline of the spindle—guide bars are unnecessary—alignment is assured—the weight of machine parts reciprocated in stroking is substantially reduced—reciprocating speeds may be increased without added power input.

By combining spindle rotation speed control, stroke control, hydraulic control panel, and MICRODIAL mechanisms in the head unit, all mechanical linkages, hydraulic pipe and fittings, usually required are eliminated.

All electrical equipment is located for most convenient service and maintenance.

Specifications

Model	723	724	728
Work capacity, dia.	¼—1″	¾—2″	1½—4″
length	¼—6″	¼—8″	¼—9″
Overall height x width x length	110x44½x60½″	127x44½x60½″	127x44½x60½″
Base at floor, width x length	44½x60½″	44½x60½″	44½x60½″
Spindle reciprocation stroke	0—⅞″	0—⅞″	
Quill stroke	10	12	12
Clearance—spindle to column	10	10	10
Spindle nose to pads, max.	46	48	48
Hydraulic oil capacity	25	25	25
Coolant tank capacity	60	60	60

MICRO MATIC
TRADE MARK REGISTERED

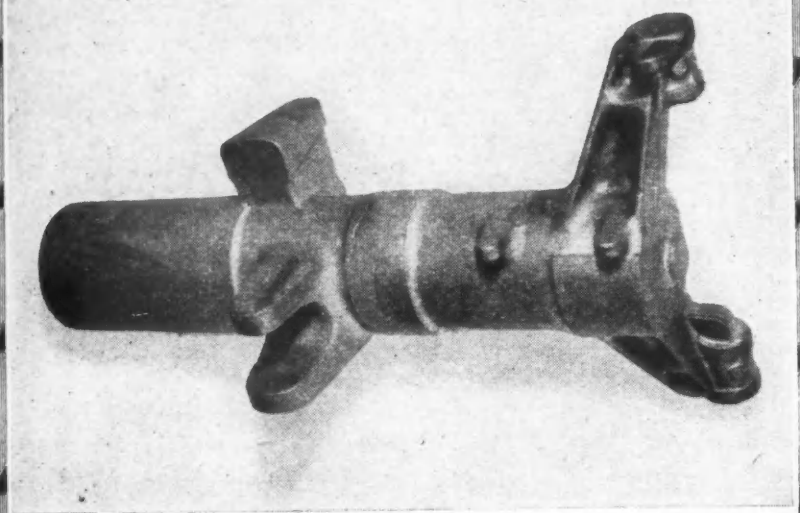
MICROMATIC HONE CORPORATION • DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES: 1323 S. Santa Fe, Los Angeles 21, Cal. • 194 Dalhousie St., Brantford, Ont., Can. • 616 Empire Bldg., 206 S. Main St., Rockford, Ill. 927 A—M & M Bldg., P. O. Box 981, Houston 2, Texas • Post Road, Guilford, Conn.

CALENDAR

Conventions and Meetings

Soc. Automotive Engineers, Aeronautic Mtg., Los Angeles .....Oct. 2-4
French Automobile Salon, Parts...Oct. 2-12
Amer. Soc. of Mechanical Engineers, Petroleum Mech. Eng. Conf. Houston, Tex. .....Oct. 6-8
Societé des Ingenieurs de l'Automobile Paris—20th Anniversary Mtg., Oct. 10-12
Natl. Conference of Industrial Hydraulics, Chicago .....Oct. 16-17
Soc. of Automotive Engineers, Production, Cleveland .....Oct. 20-21
Paris Automobile Show and SIA Meeting .....Oct. 23-Nov. 5
Amer. Soc. Tool Engineers—Semi-Annual Mtg., Boston.....Oct. 30-Nov. 1
Natl. Tool & Die Mfg. Assoc.—Annual Mtg., Phila. .....Nov. 2-5
Natl. Electrical Mfrs. Assoc., International Lighting Exposition & Conference, Chicago .....Nov. 3-7
Natl. Airport Show & Institute, Cleveland .....Nov. 4-7
Amer. Soc. of Body Engineers, Annual Tech. Convention, Detroit. Nov. 5-7
Society of Automotive Engineers, Fuels, & Lubricants Mtg., Tulsa.....Nov. 6-7
Society of Automotive Engineers-Air Transport Mtg., Kansas City..Dec. 1-3
Amer. Soc. of Mechanica Engineers, Annual Mtg., Atlantic City....Dec. 1-5
International Aviation Mtg., El Paso, Texas .....Dec. 4-7
Automotive Service Industries Show, Chicago .....Dec. 8-13
Natl. Motor Boat Show, New York City Jan. 9-17
Soc. of Automotive Engineers Annual Mtg., Detroit .....Jan. 12-16
Natl. Auto. Dealers Assoc. Exhibition, Chicago .....Jan. 25-29



—And Here's Another

Four-hundred-pound landing gear forging for one of the world's largest airplanes.

The forging know-how as developed by Wyman-Gordon during the last 60 years takes in stride forgings that not long ago seemed impossible to produce.

Put your forging problems up to WYMAN-GORDON, greatest name in forging.

WYMAN-GORDON

Forgings of Aluminum, Magnesium, Steel

WORCESTER, MASSACHUSETTS, U. S. A.

HARVEY, ILLINOIS - DETROIT, MICHIGAN

Precision Powder Spreader

(*Continued from page* 46)

ance of 0.001 in. Adjustment for thickness is important since it must compensate for the shrinkage of the lining after the double sintering.

The coated strip then enters a long tunnel-type General Electric furnace, electrically fired and with a special reducing atmosphere, for the first sintering stage. A feature of the furnace is the Pittsburgh dryer which is charged with activated alumina for maintaining a standard dew point and thus controlling moisture accurately. Upon leaving the furnace, the strip continues through a water-cooled tunnel built in the line and is recoiled on another reel at the exit end. In the operation of the strip mill complete control is exercised over the thickness of the layer of loose powder, the speed of the conveyor, and the range of temperature in the furnace.

Later the recoiled strip is processed through another strip mill primarily for an intermediate rolling of the presintered coating, and the second stage of sintering and cooling. The intermediate roll is fitted with a Reliance variable speed drive which permits the operator to adjust the speed of rolling in accordance with instructions from the metallurgical department.

The next stage of processing is in the press shop, Minster presses of various types and capacity predominating. The first step is blanking and stamping in a No. 5 Minster press; then forming and coining the half-shell in two operations in a No. 6 Minster press. The latter is fitted with a hopper which is kept filled with blanks by the operator. The sides of the shell are faced and chamfered in one operation in a special horizontal double-end machine designed by Federal-Mogul. This is followed by a group of miscellaneous detail operations: punching the oil hole on No. 3 Minster, punching the lip, milling the oil groove on a Kent-Owens high-speed milling machine, countersinking the outside and inside surfaces of the oil hole in separate operations on drill presses, and milling the oil relief on a Kent-Owens mill.

The next major operation is that of broaching the half shell to height, this being done in another special horizontal machine, using a flat broach which shaves both edges. This operation holds the measurement across both edges of the half shell within tolerance of 0.005 in.

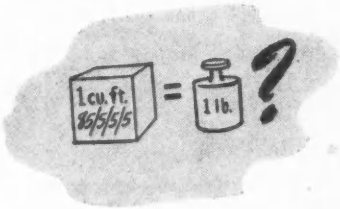
The last major machining operation is that of broaching the ID of the half shell. This is done in a special horizontal machine, using a round broach for the purpose. Broaches for copper-lead bearings are tipped with Carboloy to increase their life as well as to produce good surface finish.

(*Turn to page* 82, *please*)

QUIZ WHIZ?

9. ***If a high shrinkage alloy does not show a draw as it freezes, you can usually expect:***

(a) Gassed metal
(b) Extremely fine grain structure
(c) Difficulty in parting
(d) A casting which has high tensile strength



10. ***Why is 85/5/5/5 called ounce metal?***

(a) Because a cubic inch weighs one ounce
(b) Because one ounce each of tin, lead and zinc added to a pound of copper approximates the alloy's composition
(c) Because a cubic foot of it weighs 16 ounces
(d) Because a cubic inch weighs 16 ounces

ANSWERS

1. (c) 60%
2. (c) Aluminum
3. (d) No difference
4. (b) An alloy containing three principal elements
5. (d) Dry nitrogen
6. (b) 30%. Notice how the Federated specification number tells the alloy's composition.
7. (b) Elastic limit
8. (c) Increased fluidity
9. (a) Gassed metal
10. (b) Because one ounce each of tin, lead and zinc added to a pound of copper approximates the alloy's composition.

SCORE RATE

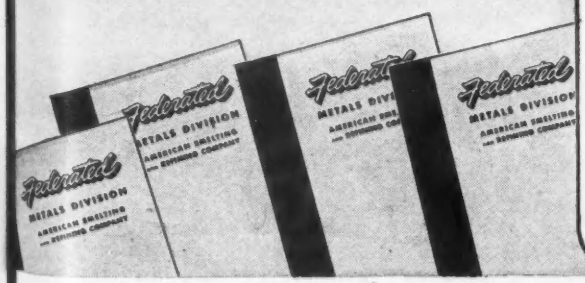
Nine or ten correct answers entitles you to honorary membership in ROKB—Royal Order of Kingsize Brains, Metals Division.

Six or seven on the right side of the ledger gets you a pat on the back and a "you should have done better."

But five or more wrong . . . uh, uh. You need help. First thing you know you'll be a full fledged member of the Blowhole Club . . . and you know that's bad.

For technical advice and assistance on all non-ferrous problems, call Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y.

For useful literature about non-ferrous casting alloys and foundry practice use the coupon at the right. Note particularly the offer of "Practical Steps for Reducing Gas Porosity In Non-Ferrous Castings."



CUT OUT

FEDERATED METALS DIVISION, Dept. AA
American Smelting and Refining Company
120 Broadway, New York 5, New York

Please send me the items I have checked:

- ☐ Non-Ferrous Metals and Alloys booklet
- ☐ Aluminum Casting Alloys booklet
- ☐ Reprints of technical articles
- ☐ Test Bars booklet
- ☐ Reprint of "Practical Steps for Reducing Gas Porosity In Non-Ferrous Castings."

Your name: .....
Company name: .....
Company address: .....
City: ..... Zone: ..... State: .....

Powder Spreader

(*Continued from page 76*)

Following broaching of the ID, the half shells are transported to the plating department. First operation is the electrodeposition of a lead-tin coating to a thickness of approximately 0.001 in. Then the work is transferred to a continuous semi-automatic plating machine, manufactured by F. B. Stevens, for applying a tin flash on the entire bearing. Each conveyor fixture of this machine holds two racks, each one containing a number of trays for the half shells.

The entire process of manufacturing the H-24 bearing demands close metallurgical supervision. Besides control of furnace temperature and conveyor speed, it is also necessary to make sampling checks of the copper-lead powder to assure conformity to specifications. To this end the laboratory checks each batch of powder for grain size, density, and chemical analysis. Similarly the metallurgical department exercises regular control in the plating department to check on plating solutions, speed of cycle, and temperature of the baths.

Further checks are made on the sintered strip before it goes to the machine shops. At the beginning and end of each coil, a laboratory worker trepans a large disc from the strip and subjects the test specimen to a Superficial Rockwell hardness test of the coating, and a test for bending and strength of bond. Also, work in process is subjected to a 100 per cent visual and dimensional inspection by floor inspectors and final inspectors.

Without repeating the operations for making flanged shell bearings, it may be noted that they go through the same kind of process except for additional operations such as flanging in the press shop and certain other steps in the machine shop.

are produced by JOHNSON "Tappet Specialists" . . . men who have made the name JOHNSON a recognized leader in the tappet industry as a manufacturer of all types of precision tappets . . . Adjustable . . . Conventional . . . Hydraulic.

Through superior design and construction JOHNSON Tappets are able to meet the most exacting specifications for automotive, aircraft, marine and diesel engines.

Exhaustive testing has shown JOHNSON Tappets improve engine performance, give better service and last longer.

Write today for new, informative JOHNSON Tappet Bulletins . . . by the makers of tappets exclusively.

Johnson PRODUCTS INC.
MUSKEGON, MICHIGAN
"Tappets Are Our Business"

BOOKS . . .

MANUAL OF FOUNDRY AND PATTERN PRACTICE by *Otis J. Benedict, Jr., McGraw-Hill* 361 pp. Although intended as a basic textbook for trade and engineering schools, this manual should be of interest to engineers and designers because of its extensive treatment of the latest practices in foundry processes and pattern making. The book is presented in two parts: the first, dealing with gray iron foundry practice, cupola management, molding, metallurgical control; the second, dealing with pattern design and construction.

SIXTY YEARS WITH MEN AND MACHINES—by *Fred H. Colvin, Whittlesey House, McGraw-Hill.* A personalized story of that grand old man, Fred Colvin, editor of American Machinist for 30 years, author of more than 40 technical books, best known for his "American Machinist's Handbook," a standard for 37 years. Many men connected with manufacturing and machine tools will enjoy this chronicle of a busy life.

THE MODERN GAS TURBINE by *R. Tom Sawyer,* B. of E.E., M.E., engineer, Diesel equipment, American Locomotive Co. Published by *Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y.* Price $4.00. This book brings together a wealth of useful information on the modern gas turbine and its varied uses as a supercharger and prime mover, including a revised chapter on jet propulsion and the gas turbine in aircraft.

Mr. Sawyer gives clear, thorough explanations of the fundamental principles of gas turbine operation, as well as a graphic description of inventions and recent developments covering industrial, marine, railroad and aeronautical applications of gas turbines. The text is fundamental in the sense that highly mathematical calculations have been omitted, thus making the discussion elementary enough for students and laymen who want a clear, practical presentation of the subject. Executives who want the principal answers without any calculations should appreciate this lucid presentation; and practising engineers should find this comprehensive coverage of the subject helpful as a reference.

Included in the text are 131 line drawings, halftones, blueprints of various types of gas turbines, as well as useful charts, graphs and tables of abbreviations and symbols. Concise summaries, bibliographies and an index are also included.

Mr. Sawyer, the author, is manager of the research department, American Locomotive Co. Chapter V, on combustion gas turbine calculations and efficiencies, was written by Ronald B. Smith, vice-president in charge of engineering of the Elliott Co. Chapter X, on the gas turbine as an aircraft prime mover, including jet propulsion, was written by S. T. Robinson and K. A. Browne, with comments by G. Geoffrey Smith.

General News

(*Continued from page* 23)

Antimony

With about 1000 tons of antimony en route to the United States from China, the antimony market, already weak, has been further depressed. The Chinese Government, it is reported, has 4000 to 5000 tons warehoused in Shanghai, which it is considering selling for as low as 25¢ a lb delivered N. Y., as contrasted with a domestic price of 34.44¢ at N. Y.

Tin

Malayan tin production has risen from a monthly production rate of about 600 tons in 1946 to about 3000 tons a month by the end of the year; however, 1947 production has been far below expectations, with a high of 3587 tons in March and a low of 369 in July. Uncertainties in Malayan tin production have been caused by unsettled labor conditions, coal shortages, and difficulty in obtaining equipment repair parts.

E. W. Bliss to Abandon Brooklyn Plant by January 1

E. W. Bliss Co., producer of stamping presses, will abandon its Brooklyn factory next January 1 as part of its expansion program in Toledo, Cleveland, Salem, Ohio, and Hastings, Mich. Mitchell M. Smith president, said that duplication of facilities, freight costs on shipments to the midwest and the nature of the Brooklyn facility led to the decision to abandon the plant.

The capacity of the Salem, O., plant is being increased by the addition of about $350,000 worth of modern machine tools as well as by the rehabilitation of several buildings, yielding 33 per cent added floor space. Skilled technicians are being transferred from the Brooklyn plant.

Appoint New Members to National Petroleum Council

New members appointed to the National Petroleum Council were recently announced by J. A. Krug, Secretary of the Department of the Interior. The Council, created by the Secretary to advise the Federal Government on oil and gas problems, is composed of outstanding representatives in the field. The new members include: Bruce K. Brown, president, Pan-American Petroleum Corp., and vice-president, Standard (Indiana) Oil Co.; Ardon B. Judd, president, Petroleum Equipment Suppliers Association, and vice-president and general manager, Republic Supply Co.; Alexander Fraser, president, Shell Union Oil Co.; Russel S. Williams, president, Individually Branded Petroleum Association of America, and president, Gasteria, Inc. of Indianapolis.

Fairchild's Al-Fin Div. Now in Farmingdale, N. Y.

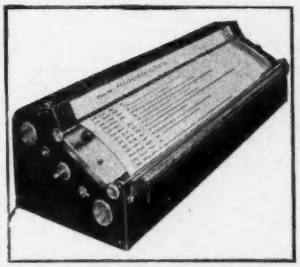
Now a division of the Fairchild Engine & Airplane Corp., instead of a subsidiary corporation, the Al-Fin Div.'s new address is Farmingdale, Long Island, N. Y.

Industrial Hydraulics Meeting in Chicago

The National Conference on Industrial Hydraulics will hold its third annual meeting in Chicago, Oct. 16-17. For the four half day sessions, the program is as follows: "Fundamentals of Hydraulic Governor Operation" by G. Forrest Drake, Woodward Governor Co., Rockford, Ill.; "Hydraulic Circuits of Industrial Process Controls" by H. Ziebolz, vice president, Askania Regulator Co., Chicago; "Fundamental Aspects of

(*Turn to page* 86, *please*)

New Automatic Device Provides Up-to-the-Minute Visual Record



The New Chart-O-Matic

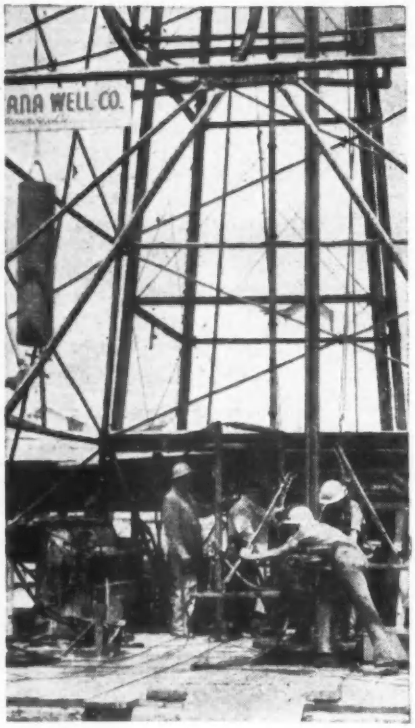
The new CHART-O-MATIC provides an instant visual record of all production, shipments, purchases, absenteeism, etc. Avoids inventory surpluses. Guides purchasing department giving constant picture of all parts and supplies on hand. Requisitions can be made direct from chart. Information from all departments transmitted to operator by Telautograph permits instant recording on CHART-O-MATIC. Does away with big wall charts and card-systems and tedious, time-consuming search for data that is often far from current. With the CHART-O-MATIC, the complete activities of the entire plant can be determined in an instant.

The entire unit is easily portable and operates from 110 volts current. Chart rotates in either direction by finger-tip control. Speed may be governed by rheostat.

New devices are proving their worth in saving time and reducing nervous tension on the job. And modern plants throughout America are finding that chewing gum on the job helps relieve monotony and helps to keep workers alert. That is why more plants every day are making Wrigley's Spearmint Gum available to their employees.

Complete details may be obtained from Spiral Mfg. Corporation, 3612 N. Kilbourn Avenue, Chicago 41, Illinois.

AB-74



4 LAYNE UNITS FOR W. MONROE, LA.

The city of West Monroe, Louisiana will soon have four complete Layne Well Water Supply units and an adequate supply of water to fulfill the needs of a growing and thriving oil metropolis. The first two were bought on confidence in the name Layne . . . but the third and fourth purchases were based upon known knowledge of how Layne Well Water Systems perform.

West Monroe city Officials know the cost of operating these systems, how they keep steadily on the job with little or no upkeep cost . . . and how they fulfill every claim made by Layne.

Layne Well Water Systems are extra rugged in quality and always give complete satisfaction.

For literature address

LAYNE & BOWLER, INC.

General Offices, Memphis 8, Tennessee

- **pumps for wells, lakes, rivers, reservoirs, irrigation—or for any use where large quantities of water must be produced at low cost. Sizes range from 40 to 16,000 gallons per minute. Write for Layne Pump Catalog.**

LAYNE

WELL WATER SYSTEMS

vertical turbine pumps

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minn., Minneapolis, Minn. ★ International Water Supply Ltd., London, Ont., Can. ★ Layne-Hispano Americana, S. A., Mexico, D. F.

General News

(*Continued from page* 85)

Cavitation" by Hunter Rouse, director, Iowa Institute of Hydraulic Research, State University of Iowa, Iowa City, Iowa; "Cavitation, the Limiting Factor in Marine Propulsion" by Karl E. Schoenherr, dean, College of Engineering, University of Notre Dame, Notre Dame, Ind.; "Cavitation in Centrifugal Pumps—Some of the Less Well-Known Factors" by R. M. Watson, assistant to the vice president in charge of engineering, Worthington Pump and Machinery Corp., Harrison, N. J.; "Hydrokinetic Transmissions" by W. F. Shurts, chief engineer, Twin Disc Clutch Co., Rockford, Ill.; "Torque Converters: Making Inefficiency Pay Dividends" by Robert Lapsley, development engineer, Clark Equipment Co.; Buchanan, Mich.; "Some Recent Developments in Hydraulic Transmissions" by R. H. Hensleigh, consulting engineer, Detroit; "Variable Speed Hydraulic Power Transmission" by James Robinson, assistant chief engineer, Vickers Inc., Detroit; "Hydraulic Fluids and Their Applications" by James I. Clower, professor and chairman, Division of Mechanical Engineering, University of Delaware, Newark, Del.; "Development of Hydraulic Seals" by W. W. Hagerty, assistant professor, Engineering Mechanics, University of Michigan, Ann Arbor, Mich.; "Postwar Aspects and Problems of Engineering Research" by Boris A. Bakhmeteff, professor of civil engineering, Columbia University, N. Y., N. Y.

Army and Navy Approve 4 Standards & Specifications

The Army and Navy Departments have approved four standards and specifications, the first of a series under the procedures established by the Army-Navy Joint Specifications Board, to help solve recurring problems of interest to technical groups. Those approved are: drawing sizes (JAN-STD-2); abbrevations for use on drawings (JAN-STD-12); welding symbols (JAN-STD-19); and anti-friction bearing identification code (JAN-STD-102). The JAN-STD-102 supersedes the published Army-Navy Numbering System for anti-friction bearings (NAVSHIPS 250-330) of June 1, 1945; this standard contains basic information from which stock numbers are determined.

Under development at the moment are a number of joint standards relating to drafting practices, including general drawing practice, format for production and construction drawings, dimensioning and toler-

(*Turn to page* 88, *please*)

Motor-operated Bench Positioner Model IP capacity 100 lbs

Better Your PROFIT Position with a better WELDING Position

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- Production increases up to 50%.
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- Better quality work, with smoother, stronger welds.
- Reduction in welding rod waste 5% to 7%.
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No matter what your positioning problem may be, Ransome can furnish equipment to solve it. Send for Bulletin 210B.

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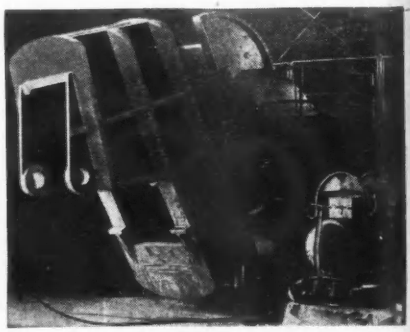

Model 400 Positioner — capacity 20 tons

Industrial Division

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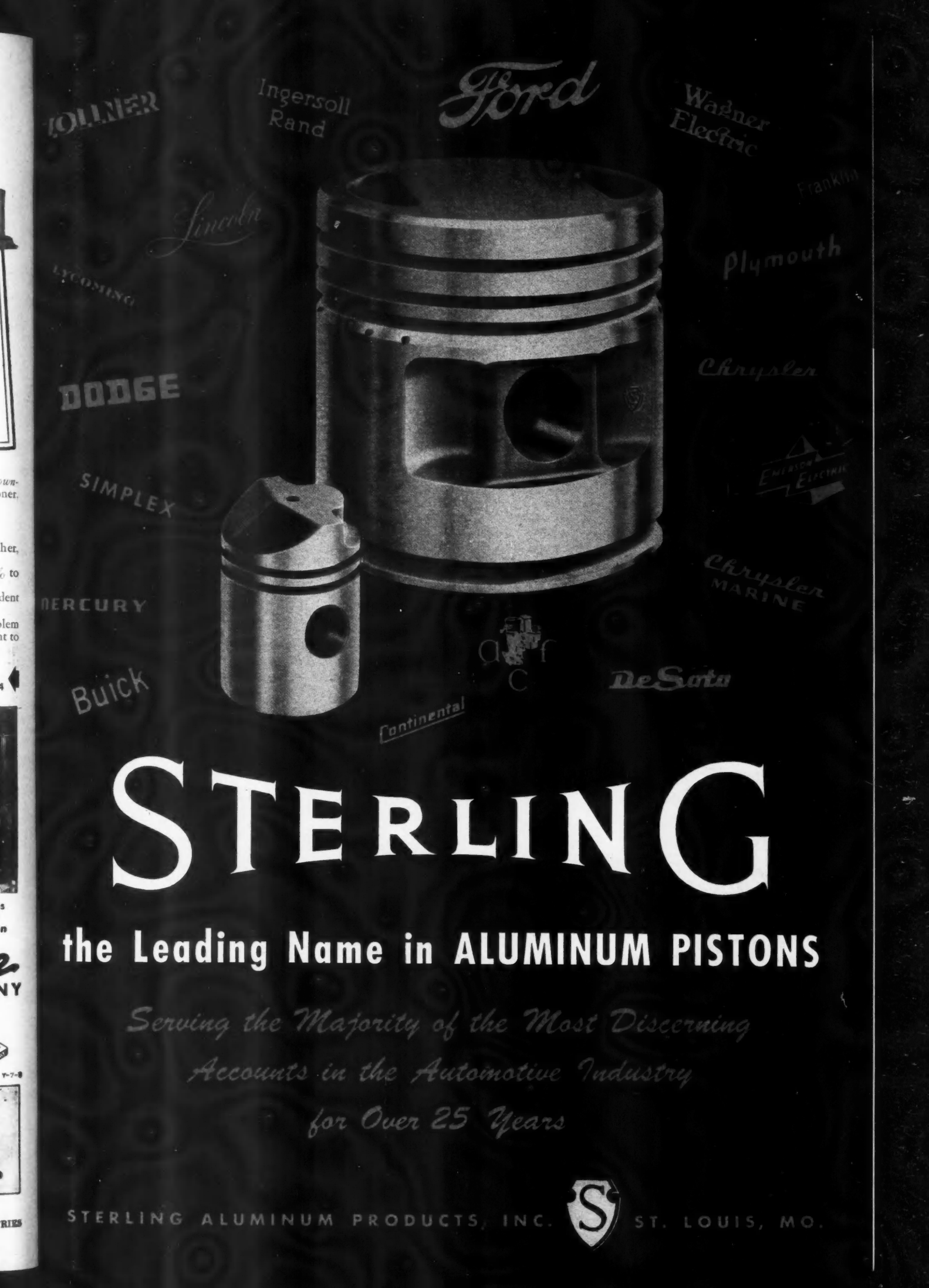
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PRECISION CUT FELT PARTS

General News

(*Continued from page* 86)

ancing, screw thread, surface roughness, electrical and electronics symbols, and non-destructive test symbols. Also under development are the following standards of general interest: welding nomenclature and definitions, welding charts, and color code for compressed gas cylinders and pipelines. Specifications, which are closely allied with standards, are being developed under a procedure similar to that of the ANJSB and more than 400 joint A-N specifications have been issued under the following heads: ordnance items, chemical items, electrical and electronics items, engineer items, shipboard items, photographic items, and packaging procedures. During the past year a great deal of progress has been made in the development of joint standards, joint specifications, and a joint numbering system for bearings, a joint Army-Navy report reveals. Aeronautical items and processes are covered by a series A-N specifications and standard drawings. Also, a series of ANMB (now the Munitions Board) specifications has been issued to describe basic materials currently on its purchase list for stockpiling. For many common items of wide application, federal specifications are being developed, including such items as metals, tools, varied equipment, etc.

WAA Sells Almost All Surplus Aircraft

Sales of $556 million worth (acquisition cost) of aircraft, mainly for salvage or scrap, during June has brought the War Assets Administration within sight of its goal, getting itself out of the aircraft business. A major portion of the $5 billion worth left over from the war now has been disposed of, Administrator Robert M. Littlejohn said. Surplus aircraft declared to WAA at the beginning of the fiscal year amounted to about 625 heavy transports, all of which are certifiable for commercial use. They are offered for sale at fixed prices ranging from $10,000 to $15,000. This figure, however, does not include about 200 two and four-engine transports under lease to commercial airlines for five-year periods. Although these leases will not begin to expire until 1949, it is expected that some will be turned back before that time as new air liners now on order are received. Nor does this figure include estimates of future declarations, since it is not expected that either Army or Navy will declare any appreciable number surplus in the near future.

Altogether, WAA officials say, about 65,000 aircraft have been sold by the agency; about 35,000 of the total were certifiable for private, civilian and commercial use. The remainder were strictly military types which were suitable only for salvage or scrap. Of those suitable for conversion to civilian use, the sales included 3775 liaison type planes; 900 utility cargo planes; 2900 light, 1300 medium and 450 heavy transports; and, 11,915 primary, 8670 basic and 4775 advanced trainers. These figures do not include 5375 civil-type planes which were turned over to CAA for its pilot-training program and were sold by that agency in 1944. Still in inventory are about $775 million worth of aircraft components. Plans for disposal of these stocks call for continuation of the agency agreements, of which there are about 75 and which account for about a third of the sales in this category.

Progressive Acquires Warren Alloy and Machine

The Progressive Welder Co., Detroit, has acquired the Warren Alloy and Machine Co. Comprising a nonferrous foundry and a die and fixture plant, the new acquisition will be operated as a separate division of Progressive Welder under the name of Warren Alloy & Machine Div.

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